Zilli, A., Brou, V.A., Klem, C., Zaspel, J.: The *Eudocima* Billberg, 1820 of the Australian Region (Lepidoptera: Erebidae)
(plates 152-166)

The *Eudocima* Billberg, 1820 of the Australian Region (Lepidoptera: Erebidae: Calpinae)

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Abstract: An annotated checklist of all species of *Eudocima* occurring from Wallacea to the Australian zoogeographical region is provided. Three species are described as new to science, *E. oliveri* sp. nov. (Vanuatu), *E. martini* sp. nov. (Solomon Archipelago) and *E. steppingstonia* sp. nov. (Marquesas Is). The following synonymies are established: *Ophideres caesar* C. Felder, 1861 = *Othreis prattorum* A.E. Prout, 1922 syn. nov. and *Ophideres kuehni* Pagenstecher, 1886 = *Lagoptera pratti* Bethune-Baker, 1906 syn. rev. *Eudocima talboti* (A.E. Prout, 1922) stat. rev. is resurrected to species level. Lectotypes for *Ophideres plana* Walker, [1858] and *Phalaena Noctua cajeta* Cramer, [1775] are also designated.

Key words: Fruit-piercing moths, review, new species, Wallacea, Pacific.

Introduction

The genus *Eudocima* Billberg, 1820 (Erebidae: Calpinae) consists of several large-sized species of fruit piercing moths distributed in tropical regions of the world, such as the well-known orchard pest *E. phalonia* (Linnaeus, 1763); a few taxa also extend to the temperate regions. Recently, descriptions of four new species, and a checklist of the genus was provided by Zilli & Hogenes (2002). Subsequently, as part of a world checklist of the then tribe Calpini, a revised list of the genus *Eudocima* was published by Zaspel & Branham (2008). Several taxonomic changes affecting some species of this genus were introduced on this revised list. But as the work consisted of a taxonomic listing only, and no supporting information was provided, uncertainty remained concerning certain taxa whose rank was nomenclaturally modified. We were able to clear up some of the enduring questions concerning certain taxa of this genus by re-examination of original and supplementary holdings at the Natural History Museum (London), Naturalis Biodiversity Center (Leiden), National Museum of Natural History (Washington), including available types, and the specialized collections of one of us (V. Brou), along with a number of colleagues (G. Behounek & W. Speidel, Munich, Germany). This contribution provides a synopsis of the species occurring in the Australian Region, from east of the Wallace line to the Central Pacific. A few comments concerning some allied species from the Oriental Region are provided to clear up the systematic relationships and taxonomy. During the course of our investigations, three new species were discovered and are described herein.

Abbreviations of repository collections:

ANIC – Australian National Insect Collection, Canberra, Australia;
CMNH – Carnegie Museum of Natural History, Pittsburgh, U.S.A.;
HUMS – Hokkaido University Museum, Sapporo, Japan;
LSUK – Linnean Society, London, United Kingdom;
MWNH – Museum Wiesbaden Naturhistorische Sammlungen, Germany;
NBC – Naturalis Biodiversity Center, Leiden (= former RMNH), the Netherlands;
NHMUK – Natural History Museum, London (= former BMNH and NHM), United Kingdom;
NMNH – National Museum of Natural History, Washington (= former USNM), U.S.A.;

OUMNH – Oxford University Museum of Natural History, United Kingdom;

SAMA – South Australian Museum, Adelaide, Australia;

ZMUC – Zoological Museum of the University, Copenhagen, Denmark.

Taxonomic part

Descriptions of the new species

***Eudocima oliveri* Zilli et Brou sp. nov.** (Figs 1-3, 21, plate 158 figs 3-5)

Holotype ♂ NHMUK: Vanuatu [= New Hebrides], Aneityum [= Anatom] Island, Agathis Camp 11, 50' [feet], 19-21.VII.1971, G.S. Robinson leg. (*Royal Society Expedition*), BMNH(E)1378103, gen. slide BMNH Noct. 22071.

Paratypes 2 specimens: 1♂ NHMUK: same data as holotype, BMNH(E)1378101, gen. slide BMNH Noct. 14736; 1♀ NHMUK: Espiritu Santo, Apouna River, Camp 2, 450' [feet], 26-27.VIII.1971, G.S. Robinson leg. (*Royal Society Expedition*), BMNH(E)1378102, gen. slide BMNH Noct. 22065.

Derivatio nominis: The new species is named for Oliver Zilli, the youngest son of the senior author.

Male: Length of forewing 39-42 mm (N = 2). Habitus similar to *Eudocima phalonia*, with comparatively more compact, less elongated forewings. Head relatively medium-sized. Thorax stout, lilac-rusty brown, with conspicuous fulvous notal tufts. Forewings with broadly convex termen, fairly produced tornal hook, long, moderately deep anal excision along inner margin and relatively small anal flap; ground color varying from greenish-golden ochre variously mottled with rusty brown speckles and ripples to more extensively suffused with dark lilac brown; transverse lines thick and blurred, dark lilac-rusty brown, lined with diffuse dark grey on side facing median area; antemedial line oblique, running from one-third of costa length towards anal flap, but faded just below anal vein, slightly incurved between cubitus and anal vein; diffuse dark brown patch with indistinct margins in place of discal stigma which merges with median shade, this only evident on middle of disc; postmedial line starting well before apex, smoothly convex and reaching anal margin beyond anal flap; apical streak bisecting apex variably expressed, very diffuse, dark rusty brown, with some diffuse dark grey or rusty shades below it in antemarginal area; fringe concolorous with ground color; veins dotted dark grey. Hindwings bright pale orange, suffused with dark brown basally; discal spot black, quite elongated and only feebly curved or flexed, slightly narrower at middle; distal black band broad, widest superiorly, ending in correspondence with vein CuA2, and enclosing big marginal intervenular rounded spots, these proximally pale orange and distally white; fringe concolorous with corresponding wing margin. Legs conspicuously tufted. Abdomen pale orange, suffused with dark brown basally; small median corema on sternum A8. Underside similar to *E. phalonia*, the hindwing maculation closely matching that of the upperside.

Male genitalia (Figs 1-3): Overall configuration similar to *Eudocima phalonia* (Figs 4-5). Tegumen-vinculum ring comparatively weak, tegumen longer than vinculum, this thin and arcuate; valva broad and elongated, flat, of approximately uniform width all through, but markedly sinuous, ending apically as broad triangular plate outwardly projected, its ventral margin thus distinctly concave below apex, then broadly convex anteriorly towards and along saccular section. Uncus with long and comparatively slender stem, distally dilated. Tuba analis with neatly invaginated, weakly sclerotized rugose scaphium. Juxta similar to *E. phalonia*, its paired processes very wide and straight, abruptly tapered at tip. Aedeagus and vesica also similar to *E. phalonia*, the latter small in size, compact and less reclinate.

Female: Length of forewing 39 mm (N = 1). Habitus similar to female *Eudocima phalonia*, forewings appearing broader, less elongated. Head and thorax brown, less stout than in male; legs more feebly tufted, slender. Forewings with crenulated termen, ground color variously mottled with pale and dark brown blotches, speckles and ripples, the latter extended over entire wing surface; blackish brown streak from wing base to inner part of median area below anal vein; transverse lines similar to female *E. phalonia*, antemedial line irregularly waved, weakly expressed, postmedial line irregularly jagged and nearly indistinct from costa to CuP, incurved between veins posteriorly; median area feebly paler than basal area and beyond postmedial line, except for broad dark median shade between cubitus and anal vein; discal stigma dark brown, subtriangular, preceded by thin dark brown streak; small pale irregular mark in interspace CuA1-CuA2 in correspondence with postmedial vein; distal area shared between wide warm brown inner suffusion and pale antemarginal area, the boundary broadly sinuous and blurred; pale area irrorated with dark brown speckles and ripples; fringe concolorous with corresponding antemarginal area, and darker scales on veins. Hindwings as in male, paler lemon-

yellow, with thinner discal spot; fringe as in male, with small black tornal spot. Abdomen and underside similar to male, but paler colored.

Female genitalia (Fig. 21): Overall configuration similar to *Eudocima phalonia* (Fig. 22). The antevaginal spine straight, ostium bursae very wide, posterior triangular sclerotization on membranous sternum A8; ductus bursae narrow and comparatively long, rugose, bursa copulatrix elongated and ridged, narrowest at middle, with anteriorly reclinate fundus to left. Ovipositor similar to *E. phalonia*.

Diagnostic remarks: Despite resemblance to the Fijian endemic species *Eudocima paulii* (Robinson, 1968), this new species is a close relative of *E. phalonia* (Linnaeus, 1763), and likely represents an insular offshoot occurring in the Vanuatu. Male *E. oliveri* can be separated from that of *E. paulii* by its larger size, more elongated forewings, bowed postmedial line on middle of forewing disc (straight in *E. paulii*), absence of white discal spot of forewings, more slender and straighter discal spot of hindwings, and very different genitalia configuration (Figs 13, 20). Outwardly female *E. paulii*, particularly those of some color forms, may more closely resemble that of this new species but *E. paulii* is smaller in size, does not have a brown subtriangular discal spot of forewings, replaced by a whitish dot, and has a broader and more incurved discal spot on the hindwings, including vastly different genitalia (Fig. 29). Compared to *E. phalonia*, males of *E. oliveri* are distinguished by broader and less elongated forewings, conspicuously mottled with rusty brown speckles and ripples, blurred, less sharp transverse lines, indistinct discal spot of forewings, and straighter discal spot of hindwings. More notable differences of the male genitalia of *E. oliveri* are the sinuous shape of the valva, and outwardly projecting apex, juxtaposed to that on *E. phalonia*, where the apex is aligned with the longitudinal axis of valva, and wider and straighter processes of juxta, a longer and thinner uncus, and smaller and less reclinate vesica towards the aedeagus. In the female genitalia, *E. oliveri* can be separated from *E. phalonia* by the broader ostium bursae, smoother and straighter antevaginal spine, thinner and longer ductus bursae, and reclinate, foot-shaped fundus bursae.

Distribution: Only two males of this new species are currently known from Aneityum, the most south-eastern island of the Vanuatu (New Hebrides) (geographically set apart and politically disputed Matthew and Hunter Islands excepted). These males show a clear systematic link to *E. phalonia*, so we have little hesitation in considering the single female from the northern Espiritu Santo Island conspecific, as it is related albeit clearly distinct from *E. phalonia*. Accordingly, the distribution of *E. oliveri* occurs across the entire Vanuatu Archipelago. We also confirm the sympatric presence of *E. phalonia* in Aneityum (2♂, Red Crest, 1,200ft, 3m. N.E. of Anelgauhat, III.1955, L.E. Cheesman, in NHMUK). From Vanuatu *E. phalonia* was previously recorded by several authors, e.g. Tams (1935), Viette (1948; 1949) and Cochereau (1965). In particular, Cohic (1953) recorded outbreaks of *E. phalonia* from Aneityum Island, but whether all these records actually refer to *E. phalonia*, or at least in part *E. oliveri*, is unknown. In addition to the aforementioned two males, from Vanuatu we have also examined specimens of *E. phalonia* from Ambae I. (= Aoba), Pau Uma (= Paama) and Malakula (in NHMUK). Interestingly though, the new species was preliminarly identified as *E. paulii* by G.S. Robinson in his collecting data sheets for the Vanuatu ([Robinson], undated), and was clearly kept separate from *E. phalonia*, recorded in turn from Espiritu Santo, Malakula, Efate and Erromango.

***Eudocima martini* Zilli et Brou sp. nov.** (Figs 18-19, 27, plate 165 figs 3-4)

Holotype ♂ NHMUK: Solomon Islands, Rendova, February 1904, A.S. Meek leg., BMNH(E)1378113, gen. slide BMNH Noct. 14826.

Paratype 1♀ NHMUK: Solomon Archipelago, Bougainville, May 1904, A.S. Meek leg., BMNH(E)1378111, gen. slide BMNH Noct. 22063.

Additional material 1♀ NHMUK: Solomon Islands, Guadalcanal, Popomanaseu ascent, Nuhu village, 28.X.1965, Royal Society Expedition leg., BMNH(E)1378112, gen. slide BMNH Noct. 22064.

Derivatio nominis: The new species is named for Martin Zilli, the eldest son of the senior author.

Male: Length of forewing 33 mm (N = 1). Habitus compact. Head large, chocolate brown in color; eye large and globular; antenna filiform, brownish orange in color; labial palpus long, first and second joints thick, compactly scaled, brown dorsally and at sides, light orange ventrally, second joint feebly incurved at base, third joint rod-like, brown, light-orange-tipped; frons with compact scale vestiture, looser at sides due to abrasion with palps. Thorax chocolate brown, darkest at tip of notal tufts. Forewings broad, with slightly irregularly crenulated termen, tornal angle broadly rounded, minimal excision along inner margin and little produced, conspicuously hairy anal flap; ground color medium chocolate brown with various darker or rusty paler brown, the latter especially between postmedial and submarginal lines; very sparse irroration of whitish scales along costal area; transverse lines barely discernible darker appearing lines, antemedial line perpendicular to costa, then bent on radius and running oblique to anal flap, crenulated irregularly; median shade fairly broad and straight from below discal spot to just beyond anal flap, postmedial line little distinct, thin, sub-rectilinear from costa to M3, where it bends inwardly to continue to inner margin beyond basal flap; cell with small discal longitudinal streak, terminated by lenticular greenish-golden discal spot; submarginal line broadly waved, splitting the distal area between inner rusty band and outer dull brown antemarginal area; fringes unicolorous dull brown; veins accentuated with conspicuous dark greyish brown dots. Hindwings pale orange, suffused dark brown basally and with wide blackish brown distal band, its inner margin subparallel to termen on middle of disc, then oblique and reaching wing margin at tornus; distal band enclosing small yellowish white marginal intervenular subquadrate spots; fringe concolorous with corresponding antemarginal area. Legs from light orange to pale greyish brown, darker brown dorsally, slender, protibia thickly clothed albeit comparatively slender, showing white dorsal dot at one third from base and additional whitish mark at very base. Abdomen colouration unstudied [due to dissection already being done on available male singleton]; presence of corema on sternum A8 [brushed off during dissection] can be inferred by well developed, long corematal frame. Underside of forewings extensively suffused medium brown, except for lighter basal one-fourth and distal subrectangular patch, light orange colored, hindwings otherwise as on upperside.

Male genitalia (Figs 18-19): Apparatus overall slender, with elongated tegumen, much longer than vinculum, this V-shaped. Valva simple, elongated and with very long sacculus, narrow at base then gradually widening, widest at distance of one fourth from apex, then slightly constricted along dorsal margin before apex, this hairy, broadly rounded, ventral margin smoothly convex. Uncus with triangular base, very long and slender, cylindrical, smoothly arched, ending into sharp apical spine. Juxta small, with broad basal trapezoid plate and short paired triangular superior processes. Tuba analis with two long thin scaphium ridges. Aedeagus cylindrical, long and narrow, ending into obovate-spatulate apex, vesica unstudied [due to dissection already being done on available male singleton], with thick patch(es) of small hair-like cornuti.

Female: Length of forewing 39 mm (N = 1). Habitus and head as in male, same on legs, except protibia is shorter tufted, forewing shape less compact, more prominent tornal hook and anal flap. Thorax has varying shades of dark brown, some whitish irroration on tegulae and notal tufts, the latter vivid fulvous posteriorly. Ground color of forewings less uniform than in male, but more distinctly variegated and rippled with various shades of brown, and sparse spattering of whitish irroration; basal area with broad blackish-brown buff below anal vein to just beyond antemedial line; transverse lines as in male, except for postmedial line, much more irregular and jagged on veins anteriorly, scalloped and inwardly curved between veins posteriorly, and submarginal, thicker; discal cell with small blackish brown ovate spot, conspicuous lenticular colored terminal stigma as on male; greenish golden patches at middle of median area, adjoined to antemedial line and along anal margin; distal area band between postmedial and submarginal lines a slightly paler rusty-brown than ground color, with veins demarcated brown in color, and dotted as on male; fringes as on male. Hindwings similar to male, with larger marginal spots. Abdomen pale orange. Underside similar to male.

Female genitalia (Fig. 27): Segment A8 frustum of a cone-shaped but with anterior margin of sternum projected antero-ventrally forming subrectangular sclerotized frame surrounding ostium bursae, membranous without distinct antrum; midventral section of sternum A8 membranous, distinctly sclerotized trapezoid lamella postvaginalis; flat, short and triangular apophyses anteriores. Long, narrow, and uniform width ductus bursae and sclerotized ridges anteriorly; small and ovoid bursa copulatrix. Ovipositor tightly linked to preceding segment due to very short intersegmental membrane, conspicuously large, subquadrate papillae anales bearing long setae; apophyses posteriores thin and rod-like, as long as papilla analis.

Female from Guadalcanal (Plate 165 fig. 5): the single female available from this island is in good agreement with that from Bougainville but differs in a few respects, more than its striking pattern, also by some features of the genitalia (see below). Despite this, we provisionally consider it conspecific with the males but prefer to exclude it from the type series, pending assessment of the whole range of variation of these apparently rarest *Eudocima* on the various islands of the Solomon Archipelago. Length of forewing 38 mm (N = 1). Habitus as in female described above, with apparently less robust and darker brown thorax, straighter antemedial line of forewing more extensive greenish golden stripes in median area, and outstanding greenish golden band in place of rusty brown one between postmedial and submarginal lines. Genitalia (Fig. 28): the sclerotized frame surrounding ostium bursae appears distinctly wider and more robust, lamella postvaginalis is wider and excised anteriorly at middle, ductus bursae is narrowest posteriorly, then widened, and anterior sclerotized section longer.

Diagnostic remarks: Together with *Eudocima caesar* (C. Felder, 1861) (in part), *E. iridescens* (T.P. Lucas, 1894), *E. cocalus* (Cramer, [1777]), and *E. kuehni* (Pagenstecher, 1886), within this group occurring from Wallacea into the Pacific, *E. martini* is one species without black discal spots on the hindwings, though features of its forewing pattern (e.g. greenish golden discal spot) and differences in genitalia configuration make it unmistakable. Features of both male and female genitalia of *E. martini*, such as the long thin uncus, small juxta, thin aedeagus and very small bursa copulatrix are unusual within the genus *Eudocima*.

Distribution: Currently known only from the Solomon Archipelago, where it is likely endemic and apparently very rare. We located a second female of the green banded form in the Cornell University Insect Collection, but damaged with only three intact wings, and minimal label data, i.e. (from) Solomon Islands.

***Eudocima steppingstonia* Brou, Klem, Zaspel et Zilli sp. nov.** (Figs 6-8, 23, plate 161 figs 1-3)

Holotype ♂ NMNH: Marquesas Islands, Fatu Hiva, Mt Teoaiua [= Teearua], 2,000 ft, 22.III.1968, J.F.G. & T.M. Clarke leg., USNMENT01069399, gen. slide.

Paratypes 2♀ NMNH: Marquesas Islands, Fatu Hiva, Mt Upe, 2,025 ft, 3.IV.1968, J.F.G. & T.M. Clarke leg., USNMENT01069400.

Derivatio nominis: The new species is named following latinization of the concept of "stepping stones", the phenomenon in dynamic biogeography which its ancestor should have undergone in order to colonize the remote island of the Pacific where it occurs.

Male: Length of forewing 41 mm (N = 1). Overall habitus somewhat similar to members of the *Eudocima cajeta*-group. Head large, chocolate brown in color; eye large and globular; antenna filiform, dark brownish orange in color; labial palpus long, chocolate brown outside, paler beige internally, with first and second segments thick, compactly scaled, and third one slender, apically spatulate with dilated tuft; frons thickly clothed with hood-shaped, quite rough scale vestiture. Thorax chocolate brown. Forewings elongate with acute apex and feebly crenulated termen, pronounced albeit not distinctly hooked tornal angle, long shallow anal excision and conspicuous anal flap; ground color rather uniform chocolate brown, albeit darker in proximal half of wings, with lilac shine; transverse lines deep dark brown but mostly indistinct against ground colour, traces of subbasal line discernible with particular orientation of wing, antemedial line thin, smoothly convex, median shade wide and blurred, straight from discal stigma to anal flap, postmedial line smoothly convex, almost faded, submarginal line as a very faint, slightly sinuous hue in anterior half of distal area; discal cell with deep blackish brown dot, terminated by broad lenticular discal stigma; veins dotted dark blackish brown and along anal margin in distal half of wings; fringe concolorous with ground color. Hindwings comparatively oblong, with slightly crenulated outer margin, pale yellowish straw colored with smoky brown discal spot and distal band, these markings with irregularly scalloped and blurred edges, the spot long with large posterior lobe much prolonged towards wing margin, and band ending well before anal angle; fringe chequered beyond distal band, concolorous with ground color in interspaces and smoky brown at veins, elsewhere as ground color. Legs slender, chocolate brown externally, paler beige internally, with rough fringe of long hair-like scales on outer side of protibia. Abdomen pale yellowish straw on both sides, feebly irrorated with brown middorsally at very base; corema on sternum A8 small. Underside of forewings with quite rough scaling in basal half, broadly straw colored in basal area, along anal margin and with two blotches beyond middle of disk, otherwise smoky-brown; underside of hindwings extensively straw colored, patterned as on upperside except for much fainter distal band, turning in apical and costal areas into tiny ripples dissolving against pale ground color.

Male genitalia (Figs 6-8): Overall configuration similar to members of the *Eudocima phalonia*-group. Tegumen hood-like, massive with respect to vinculum, this thin and arcuate; valva small, lozenge-shaped. Uncus greatly developed with long finger-like stem, incrassate distally with hooked tip. Tuba analis conspicuous, with long rugose scaphium analogously developed to accommodate uncus. Juxta similar to *E. phalonia*, its paired processes not of uniform width though, but broadest at base and gradually tapered towards slightly sinuous tip. Aedeagus and vesica also similar to *E. phalonia*, with corpus of vesica bearing dorsally patch of quite stout deciduous, basally minutely spiculated cornuti, and a ventrally protruding lobe.

Female: Length of forewing 40-42 mm (N = 2). Habitus similar to females of the *Eudocima cajeta*- and *E. phalonia*-groups. Head and thorax as in male, more minutely variegated with paler and darker brown and sparse beige scales, the frons tipped by shorter hood of scales. Forewings elongate, broader than in male, with distinctly crenulated termen; ground color distinctly mottled with pale and dark brown blotches and irregularly distributed dark to blackish brown ripples; basal area with black buff below anal vein to just beyond antemedial line; transverse lines blackish brown and mostly disrupted into ripples against ground color, subbasal and antemedial lines barely discernible, median shade thick and blurred, postmedial line more evident, similar to male although thicker and irregularly crenulated, scalloped and inwardly curved between veins posteriorly, submarginal line much better expressed than in male, running from just before apex to tornus, albeit diffuse and poorly distinct from interspace between CuA veins to below; discal cell with distinct blackish brown dot, terminated by large sock-shaped discal stigma; distal area shared by submarginal line into inner section with particularly homogeneous tinges, chocolate brown anteriorly and beige posteriorly, and beige antemarginal section densely irrorated with dark to blackish-brown ripples; veins and anal margin more conspicuously dotted than in male; fringe dark brown. Hindwings particularly oblong, patterned as in male, with more conspicuously chequered fringes. Legs and abdomen colored as in male, with darker brown very tip of the latter. Underside patterned as in male, with similar to much stronger dissolution of dark markings into ripples against pale ground color, especially as regards distal band of hindwings, which may thus be particularly cleared.

Female genitalia (Fig. 23): Overall configuration similar to members of the *E. phalonia*-group; antero-ventral portion of segment A8 wide and little extended anteriorly, antevaginal spine stout and straight, comparatively broad-based and gradually tapered to pointed tip; sternum A8 sclerotised posteriorly, embedding triangular lamella postvaginalis, and with thickly setose posterior margin; apophyses anteriores comparatively strong, well sclerotized; ostium bursae of medium width, ductus bursae medium long, rugose, bursa copulatrix long and rugose, ridges weakly sclerotized in posterior half, fundus slightly reclinate to right. Ovipositor with thin rod-like apophyses posteriores and thickly setose papillae anales.

Diagnostic remarks: Despite its possibly closest resemblance in habitus with members of the *Eudocima cajeta*-group, the new species shows clear affinities in both male and female genitalia with those of the *E. phalonia*-group. It can easily be distinguished from any of the latter by several features of the habitus such as the extensively smoky-suffused forewings or the particularly pale and oblong hindwings with blurred-edged markings whose outer margin does not protrude in correspondence of vein 3A. The most striking diagnostic characters are found however in the male genitalia, notably in the greatly developed elongated uncus which sharply contrasts with the usual short stout configuration seen in the *E. phalonia*-group and most *Eudocima* in general. Other meaningful differences are found in the configuration of valvae, juxta, vesica and the stouter spiculated cornuti of the latter. In the female genitalia the new species shows possibly the closest similarity with *E. oliveri* sp. nov., although it can be easily differentiated from this, among the other, by the shorter and wider ductus bursae and the fundus bursae reclinated to the right instead of left.

Distribution: Currently known only from Fatu Hiva, the most isolate of the Southern Marquesas Islands. The type series was collected during the expedition accounted on by Clarke (1986).

Annotated list

A full taxonomic layout of the species of *Eudocima* known to occur in the Australian region is presented. Particular attention was made to checking original descriptions in order to properly determine primary type materials. The notation “by likely monotypy” implies that there are indications that only one specimen was available to the descriptor. This evidence may take the form of no range measurement being given, an indication of only one person having communicated the specimen to the descriptor, subsequent statements by the same author, or the location of only one extant specimen. When in original descriptions intervals of body measurements or more collectors were given, but no specimens were declared as types, this led us to consider that more specimens were available and that they have the status of syntypes, regardless of the descriptor labelling one of them as “(holo)type”.

***Eudocima aurantia* (Moore, 1877)** (Plate 152 figs 1-2)

Ophideres aurantia Moore, 1877. *Proceedings of the scientific Meetings of the zoological Society of London*

1877 (3): 607. Type locality: S. Andamans. Type material: number and sexes originally unspecified, male(s) only after subsequent indication by Moore (1881), ♂ holotype [by likely monotypy], implicitly designated as lectotype by Swinhoe (1900), in NHMUK (examined).

= *Adris rutilus* Moore, 1881. *Transactions of the zoological Society of London* 11 (3): 70. Type locality: Ceylon. Type material: unspecified number albeit at least two male syntypes, ♂ syntype, in NHMUK (examined).

Widespread in the SE Palaearctic, Oriental and Australian regions, in the latter it extends from Wallacea across New Guinea and Northern Australia (Queensland) to east of the Sahul shelf in the Bismarck Archipelago (New Britain, New Ireland) and the Solomon Archipelago (Bougainville, Nggela (= Florida) Is.).

***Eudocima prolai* Zilli et Hogenes, 2002** (Plate 152 figs 3-4)

Eudocima prolai Zilli et Hogenes, 2002. *Quadrifina* 5: 157, figs 10-11, 40, 42-45. Type locality: Irian Jaya, Star Mountains, Abmisibil, 1890 m. Type material: ♂ holotype [by original designation], in NBC (examined).

So far known from New Guinea only.

***Eudocima cocalus* (Cramer, [1777])** (Plate 152 figs 5-6)

Phalaena Noctua cocalus Cramer, [1777]. *De uitlandsche Kapellen voorkomende in de drie Waereld-Deelen Asia, Africa en America by een verzameld en beschreeven* 2: 59 [text], 148 [index], pl. 134, fig. B [name dates from main text]. Type locality: Oostindiën. Type material: number and sexes originally unspecified but a single male illustrated, probably lost.

= *Noctua maculata* Weber, 1801. *Observationes entomologicae, continentes novorum quae condidit generum characteres, et nuper detectarum specierum descriptiones*: 111. Type locality: ex India orientali. Type material: number and sexes originally unspecified, probably lost.

= *Ophideres plana* Walker, [1858]. *List of the Specimens of lepidopterous Insects in the Collection of the British Museum* 13: 1226. Type locality: Java, Silhet, North Hindostan. Type material: 3 syntypes, sexes originally unspecified but original wording contradictory on this issue; description and type series composite, comprising both concepts of *Eudocima cocalus* (Cramer, [1777]) and *E. hypermnestra* (Stoll, [1780]) (♀♀ syntypes from Java and Silhet, respectively, both in NHMUK, examined), hereafter ♀ lectotype: Java, here designated, in NHMUK.

= *Rhytia (Ophideres) crepidolata* T.P. Lucas, 1894. *Proceedings of the linnean Society of New South Wales* (2) 8 (2): 149. Type locality: Geraldton. Type material: unspecified number albeit at least two male syntypes, in SAMA.

Pending synonymy: *Phalaena Noctua hypermnestra* Stoll, [1780], in Cramer P. & Stoll C., [1780-1782]. *De uitlandsche Kapellen voorkomende in de drie Waereld-Deelen Asia, Africa en America by een verzameld en beschreeven* 4: 69 [text], 249 [index, misprinted as 251], pl. 323, figs A-B [name dates from main text]. Type locality: Kust van Coromandel. Type material: number and sexes originally unspecified, but a female illustrated (recto/verso), probably lost (Plate 153 figs 1-3).

The original combination of *Phalaena Noctua cocalus* occurs in the main text by Cramer ([1777]: 59), as he states at the species being described next on Fig. C that this "behoort nevens Fig. B. onder de *Phal. Noctuae*".

Both the description and type series of *Ophideres plana* clearly incorporate the concepts of *E. cocalus* and *E. hypermnestra* (Stoll, [1780]), as Walker ([1858]) considered *O. plana* to include also a variety with paired black discal spots on the hindwings and with the black border not extending to the interior angle. Accordingly, in order to stabilize nomenclature, the syntype from Java in NHMUK, which corresponds to the current concept of *E. cocalus*, is here designated as lectotype. Despite the fact that Walker's description of forewings is applicable only to females, in describing his variety he states that it has "marginal spots larger than in the female", which implies he had also a male at disposal. The tracing of only two out of three original specimens of *O. plana*, both females, does not allow to solve this issue, although it is worth mentioning that Walker was often wrong in recording sexes.

Eudocima cocalus is widely distributed from SE Asia (Sunda Islands, Philippines) across Wallacea to New Guinea, Australia (Western Australia, Queensland), the Bismarck Archipelago (New Britain, New Ireland, St. Matthias, St. Aignan), Nissan I. and the Solomon Islands (Santa Isabel, Nggela = Florida Is). Nonetheless, research is currently in progress to assess whether *E. hypermnestra*, which is currently credited with species status, should be sunken into *E. cocalus*. In fact, despite some noteworthy differences in the habitus, notably the presence of paired black discal spots on the hindwings, the more neatly scalloped inner margin of the distal black band of the hindwings, the same band enclosing larger pale marginal spots and barely reaching tornus, no meaningful structural differences between the two in the genitalia have been found. It is worth noting that another species from this group sharing an overall similar pattern (bending of postmedial line of forewing excepted), the Philippine endemic *Eudocima treadawayi* Zilli et Hogenes, 2002, is deeply differentiated in genitalia configuration.

Concerning their distribution, *E. hypermnestra* and *E. cocalus* seem to be substantially allopatric, with some noteworthy albeit questionable exceptions. There are a handful of old records of *E. cocalus* from Hindostan, Coromandel, Bengal and Silhet (Walker, [1858], Moore, 1867, 1881; Hampson, 1894), thus well within the range of *E. hypermnestra*, but we were unable to locate any vouchers in support of these quotations. It should be noted, however, that some confusion about the two concepts happened in the past, as shown by the case of *Ophideres plana*, which was usually considered to relate to the species other than *E. hypermnestra* but its original concept included also real *E. hypermnestra* from the Indian subcontinent.

A thorough check across the whole holdings at NHMUK revealed *E. cocalus* only from the Greater Sunda Islands and the Philippines eastwards, while *E. hypermnestra* is essentially a continental species ranging from India and Sri Lanka to Southern China and whole Indochina; it is also present in the Andaman and Nicobar Islands, occasionally with specimens showing faded hindwing spots. Regarding its presence in the Malay Peninsula, we could locate two old specimens of *E. hypermnestra* labelled “Malacca”, whereas H.S. Barlow, who extensively collected in Genting Highlands, confirmed to have neither found *E. hypermnestra* nor *E. cocalus* over the years. He informs us also that old specimens labelled from “Malacca” were not necessarily collected in that region, but only shipped from there to Europe. However, another specimen from Penang has full collecting data which appear more reliable. It thus seems that *E. hypermnestra* may occasionally extend down the Malay Peninsula, although it is very rarely observed. In contrast, only *E. cocalus* appears to be present in Sumatra and in islands off the Malacca strait. Strangely enough, old albeit clear *E. cocalus* specimens that were labelled as from Hong Kong were located, which is quite surprising in the light of recent records of *E. hypermnestra* only from that area (Kendrick 2002). Here the same consideration as for Malacca may apply as well (H.S. Barlow, pers. comm.).

In the old literature there are also some records of *E. hypermnestra* from well inside the range of *E. cocalus* which further confirm how names have been misapplied in the past. For instance, Snellen (1876) mentions *E. hypermnestra* in Java but does not mention *E. cocalus*, which is exceedingly common in that island; or Kirsch (1877), who in recording *E. hypermnestra* from Rubi in New Guinea clearly stressed the oddity of his specimen in being completely devoid of discal spots on the hindwings, as it in fact should be for *E. cocalus*.

Populations of *E. cocalus* from New Guinea are quite remarkable in that individuals appear to be stouter bodied than Sundanian ones. Nonetheless, no other meaningful difference could be found between them.

***Eudocima discrepans* (Walker, [1858])** (Plate 153 figs 4-6)

Ophideres discrepans Walker, [1858]. *List of the Specimens of lepidopterous Insects in the Collection of the British Museum* 13: 1227. Type locality: Singapore. Type material: number and sexes originally unspecified, ♂ holotype [by likely monotypy], implicitly designated as lectotype by Swinhoe (1900), in OUMNH (picture examined).

= *Ophideres archon* [C. & R.] Felder, [1874], in Felder C., Felder R. & Rogenhofer A.F., [1865]-1875. *Reise der Österreichischen Fregatte Novara um die Erde in den Jahren 1857, 1858, 1859 unter den Befehlen des Commodore B. von Wüllerstorf-Urbair* (Zoologischer Theil) 2 (2) (Atlas): pl. 113, fig. 3. Type locality: Siam. Type material: unspecified number of females, ♀ holotype [by likely monotypy], implicitly designated as lectotype by Swinhoe (1900), in NHMUK (examined).

Zilli & Hogenes (2002) attributed authorship of *Ophideres archon* to Rudolf Felder only, most likely in error, while Zaspel & Branham (2008) did to both Cajetan Felder (father) and Rudolf Felder (son) on the basis of new evidence provided by Nässig & Speidel (2007). In reality, these authors remained in doubt and disagreed between themselves in the attribution of authorships for taxa described by “Felder” on plates 108-140 (Felder et al. [1874] in [1865]-1875), and concluded that if a role by Cajetan in the descriptions can be given as granted, a contribution by Rudolf was still possible, particularly for plates 108-120. They suggested therefore to use “C. (& R.?) Felder”. Due to enduring uncertainty on this issue and unfeasibility of disentangling the role by Rudolf, if any, with respect to his father’s, we prefer to highlight this situation by putting both names within brackets. As concerns the dates of publication, plate 113 is undated and lies between two plates edited as in 1873, but Nässig & Speidel agree with Fletcher (1979) in dating the whole Heft 4 containing plates 108-120 as from 1874.

Widespread in the SE Palaearctic and Oriental regions from India eastwards, its range also partly extends in Wallacea, precisely in the lesser Sunda Islands up to Flores. Replaced to the east by its vicariant *Eudocima muscigera* (Butler, 1882). Records of *E. discrepans* from New Guinea (Kononenko & Pinratana 2005) are therefore most likely due to misidentification with this latter.

***Eudocima muscigera* (Butler, 1882)** (Plate 154 figs 1-4)

Purbia muscigera Butler, 1882. *The Annals and Magazine of natural History, including Zoology, Botany, and Geology* (5) 10 (57): 230. Type locality: New Britain. Type material: number and sexes originally unspecified, ♂ holotype [by likely monotypy], in NHMUK (examined).

An eastern vicariant of *Eudocima discrepans* (Walker, [1858]) characterized by a distinctly smaller size, squarer shape of forewings with nearly straight termen and more oblique transverse lines on disc, and sharing with this species a similar sexual dimorphism. So far known from Aru Is, Dampier Strait group, New Guinea, Japen I., Fergusson I. and the Bismarck Archipelago (New Britain, New Ireand, Mioko I.).

***Eudocima homaena* (Hübner, [1823])** (Plate 154 figs 5-6)

Othreis homaena Hübner, [1823]. *Verzeichniss bekannter Schmettlinge* [sic]: 264. Proposed as a replacement name for *Phalaena Noctua ancilla* Cramer, [1777] nec Linnaeus, 1767.

= *Phalaena Noctua ancilla* Cramer, [1777]. *De uitlandsche Kapellen voorkomende in de drie Waereld-Deelen Asia, Africa en America by een verzameld en beschreeven* 2: 84 [text], 147 [index]), pl. 149, fig. F [name dates from the index] [preoccupied by Linnaeus, 1767]. Type locality: Kust van Coromandel. Type material: number and sexes originally unspecified, but a female illustrated, probably lost.

= *Phalaena strigata* Donovan, [1804], in 1800-[1804], nec Fabricius, 1794. *An Epitome of the natural History of the Insects of India, and the Islands in the Indian Seas*: [60], pl. [48], fig. 2. Type locality: Bengal. Type material: unspecified number of females, probably lost.

= *Ophideres bilineosa* Walker, [1858]. *List of the Specimens of lepidopterous Insects in the Collection of the British Museum* 13: 1227. Type locality: Ceylon, and unspecified. Type material: 3 syntypes (1 Ceylon, 2 without locality, dubiously from Ceylon), sexes originally unspecified but description only compatible with males; ♂ lectotype from Ceylon, implicitly designated by Swinhoe (1900), in NHMUK (examined).

= *Othreis ancilla formosana* Okano, 1964. *Tohoku Konchu Kenkyu* 1 (2): 43, pl. 4, figs 2-3. Type locality: Wushe, Jen-ai-hsiang, Nantow-hsien, Central Formosa. Type material: ♂ holotype [by original designation], in HUMS.

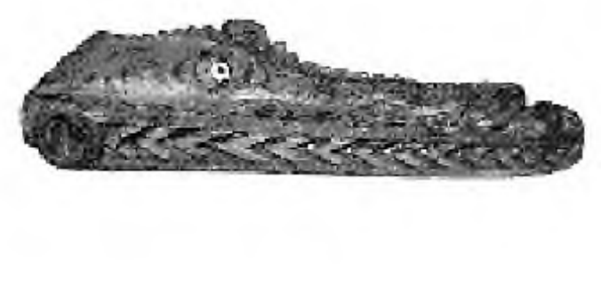
Widespread in the E Palaearctic and Oriental regions from India and Sri Lanka eastwards, its range extends also in Wallacea, precisely in Sulawesi, Lombok, Flores and Timor. So far there are no zones of known overlap with its relative *Eudocima caesar* (C. Felder, 1861) but, interestingly, material from Sula Is (Mangole, Besi = Sanana) seems transitional to this and will require further study. Quite some geographic variation can be recognised within *E. homaena*, with individuals from the Indian subcontinent and Sri Lanka somewhat smaller and paler colored, contrary to most eastern ones. Particularly large-sized and with deeper lilac brown forewings appear to be those from Sulawesi, and at a lesser extent those from the Philippines, the former also with neatly rounder discal spots of the hindwings.

***Eudocima caesar* (C. Felder, 1861)** (Plate 155 figs 1-6)

Ophideres caesar C. Felder, 1861. *Sitzungsberichte der kaiserlichen Akademie der Wissenschaften*, (mathematisch-naturwissenschaftliche classe) 43 (1): 41. Type locality: Amboina [= Ambon]. Type material: unspecified number albeit at least two specimens of both sexes, ♀ syntype, in NHMUK (examined).

= *Othreis prattorum* A.E. Prout, 1922 **syn. nov.** *The Bulletin of the Hill Museum* 1 (2): 239; illustrated in Prout (1924b: pl. 20, figs 6-7, as ♂ holotype and ♀ allotype). Type locality: Manusela, 6,000 feet. Type material: 6♂ & 1♀ syntypes, in NHMUK (examined).

A strictly Moluccan species so far known exclusively from Halmahera, Buru, Ambon and Seram, with possible intermediate populations with the preceding species in the Sula group (see above). Interestingly, this is a polymorphic species as regards expression of the discal spot on the hindwings. Most of the few specimens known are devoid of the spot, but this happens to occur after a variable degree of expression, viz. from full to nearly obliterated, in at least three specimens from Halmahera and Seram, as already shown in Prout's (1924b) illustration of a syntype. As a result, these specimens look extraordinarily similar to *Eudocima homaena* (Hübner, [1823]) but they can easily be distinguished other than by their dimension, *E. caesar* being a much larger sized species, after the fringes of the hindwings, which are chequered black and orange in *E. homaena* and unicolorous black in *E. caesar*. Zilli & Hogenes (2002) discussed the hitherto unrecognized identity of *Ophideres caesar* C. Felder, 1861, collected by C.L. Doleschall in Ambon, and concluded that the name was most likely a senior synonym of *Othreis prattorum* A.E. Prout, 1922 but had better to be ranked as a nomen dubium. In fact, Felder (1861) directly linked his species to Cramer's *E. ancilla* (viz. female *E. homaena*) but stated



that it was larger. Considering that he did not mention any discal spot on the hindwings and which species of *Eudocima* actually live in the Moluccas, there was little doubt that *E. caesar* and *E. prattorum* would relate to the same concept, although no conclusive evidence was available. In contrast, Zaspel & Branham (2008) followed directly Poole (1989) and listed again *E. caesar* as a validly recognized species, but no new information about its identity was brought forward, although *E. prattorum* was maintained as valid as well. Following extensive search through the NHMUK collections, where types by C. Felder ended up via the purchase of his collection by L.W. Rothschild, a syntype of *E. caesar* could eventually be found. This had long been unrecognised due to the fact that its original, small label stating "Amboina Doleschall 1857" remained hidden under a larger one bearing "Felder Colln." and stacked up in a flat pile of accession labels. Its features leave no doubt therefore that the concepts of *E. caesar* and *E. prattorum* relate to the same species, hereafter the two names are brought here into synonymy and as conditions for reversal of precedence are not met (ICZN, 1999: art. 23.9) the oldest is reinstated as the valid name for the species here dealt with.

***Eudocima iridescens* (T.P. Lucas, 1894)** (Plate 156 figs 1-3)

Othreis (Ophideres) iridescens T.P. Lucas, 1894. *Proceedings of the Linnean Society of New South Wales* (2) 8 (2): 148. Type locality: Geraldton. Type material: unspecified number albeit at least two male syntypes, in SAMA.

= *Ophideres pyrocrana* A.J. Turner, 1908. *Transactions and Proceedings and Report of the royal Society of South Australia* 32: 63. Type locality: N.Q. [= North Queensland], Kuranda. Type material: ♂ holotype [by original designation], in ANIC.

The most eastern member of a group characterised by striking sexual dimorphism, whose females show a wide green transverse band crossing the forewings, which comprises also *Eudocima homaena* (Hübner, [1823]) and *E. caesar* (C. Felder, 1861). *Eudocima iridescens* always lacks a black discal spot on the hindwings and may thus look similar to unspotted individuals of its Moluccan relative, *E. caesar*. Nevertheless, it can easily be separated after its somewhat more saturated and warmer colors, smaller size, forewings of male more obovate with more sigmoid postmedial line and sharper line bisecting the apex, and above all the more uniformly arched distal band of the hindwing much prolonged towards the anal margin, and the black-tipped abdomen. Specimens from New Britain appear particularly large-sized, with comparatively narrow distal band on hindwings and, in the male sex, paler, more variegated forewings.
Known so far from Misool (= Mysol), Kei Is, New Guinea, Cenderawasih Bay islands (Moor I.), Bismarck Archipelago (St. Aignan, New Britain, New Ireland), Fergusson I., Sudest I., Rossell I., Woodlark I. (= Muyua I.), Australia (Western Australia, Queensland).

***Eudocima talboti* (A.E. Prout, 1922) stat. rev.** (Plate 157 figs 1-5)

Othreis cajeta talboti A.E. Prout, 1922. *The Bulletin of the Hill Museum* 1 (2): 238. Type locality: Manusela, 6,000 feet. Type material: 2♂♂, 2♀♀ syntypes, in NHMUK (examined), incorrectly labelled as ♂ holotype, ♀ allotype and ♂♀ paratypes.

Eudocima talboti is the most eastern member of the *cajeta*-group, which includes three superficially similar species from the Indoaustralian region characterised by sharp sexual dimorphism, the others being *E. cajeta* (Cramer, [1775]) and *E. srivijayana* (Bänziger, 1985). Males of the group show well distinct sub-parallel ante- and postmedial lines which run from costa towards inner margin of forewings, thus they define a median area which encloses a lenticular or subrectangular discal spot. The postmedial line originates at costa well before the apex and there is no apical line or streak bisecting the latter; in addition, the tornus may be distinctly inwardly hooked. In turn, females show a greatly irregularly mottled-rippled pattern which leads transverse lines to dissolve against ground color. They miss the vivid green transverse band seen in many relatives and have greatest similarities with those of the well-known fruit pest *E. phalonia* and its close allies. On the hindwings of both sexes a black discal spot and distal band are present. In the configuration of genitalia, however, the three species show little similarity to each other.
Diagnostic hints on how to distinguish the three species of the *cajeta*-group are given under *E. srivijayana*.

Eudocima cajeta (Cramer, [1775]) (Plate 158 figs 1-2, plate 166 figs 1-2) [exclusively Oriental species]

Phalaena Noctua cajeta Cramer, [1775]. *De uitlandsche Kapellen voorkomende in de drie Waereld-Deelen Asia, Africa en America by een verzameld en beschreeven* 1: 48 [text], 152 [index], pl. 30, figs A-B (male), C (female) [name dates from main text]. Type locality: Coromandel... Batavia [= India, Coromandel... Java, Jakarta]. Type material: unspecified number of syntypes, at least two of both sexes, and lost; therefore, lectotype: ♂ [Coromandel], hereby designated in force of ICZN (1999: art. 74.4) as the specimen illustrated by both Cramer (1775, in 1775-1776) on plate 30, figs A-B and [Wartenaar Lambertz] (undated) on plate 54, figs A-B.

= *Ophideres multiscripta* Walker, [1858]. *List of the Specimens of lepidopterous Insects in the Collection of the British Museum* 13: 1226. Type locality: Ceylon. Type material: sex originally unspecified, ♀ holotype [by monotypy], in NHMUK (examined).

Due to the mixed type locality in the original description of *Phalaena Noctua cajeta*, the relevant type series, consisting of at least two albeit in full evidence lost syntypes, has to be considered as mixed too and actually combining Indian specimens of *E. cajeta* with Javanese ones of *E. srivijayana* (Bänziger, 1985). Because of the close resemblance of the two species and some mismatching features portrayed in the illustrations given by Cramer ([1775], in [1775-1776]) it is not feasible to unambiguously identify each of the two pictured specimens. The same applies to the original illustrations by [Wartenaar Lambertz] (undated) for Cramer's printed work, where the same specimens are portrayed in plate 54. Nevertheless, in the original artwork provenance of individual specimens is recorded in relevant legends. Accordingly, in the legend to plate 54, the male (Figs A-B, recto/verso) is aligned with the indication "Coromandel" and the female (Fig. C) with "Batavia" (Plate 166 figs 1-4). This is considered sufficient evidence for concluding that the male and female were of Indian and Javanese origin, respectively. Present lectotype designation of the male specimen agrees therefore with Bänziger's (1985) concept of *E. cajeta*, who erroneously considered it as solely described from Coromandel, and removes any ambiguity on the application of this name, which can therefore be applied to the most western species of the *cajeta*-group.

Diagnostic hints on how to distinguish the three species of the group are given under *E. srivijayana*.

***Eudocima srivijayana* (Bänziger, 1985)** (Figs 9-12, 24, plate 156 figs 4-6, plate 166 fig. 3)

Othreis srivijayana Bänziger, 1985. *Heterocera sumatrana* 2: 42, figs 1-3, 5 (sub *cajeta*), 9. Type locality: Indonesia: W-Sumatra, Lebong Tandai. Type material: ♂ holotype [by original designation], in NHMUK (examined).

Following the discovery of *Eudocima srivijayana*, a close relative of *E. cajeta* (Cramer, [1775]), then the only member of the group, Bänziger (1985) examined several specimens from the Indoaustralian tropics and was at the same time able to unambiguously upgrade the taxon *Othreis cajeta talboti* A.E. Prout, 1922, to species level. In fact, *E. talboti*, originally described from Seram (Moluccas) (Prout 1922), had sharp differences in the male genitalia with respect to the other two species, though these were only stated in words, no genitalia illustrations having been provided (Bänziger, 1985). *Eudocima talboti* was subsequently validated by Zilli & Hogenes (2002) on the basis of the diagnostic characters recorded by Bänziger (1985) but Zaspel & Branham (2008) placed it as a full synonym of *E. cajeta* (in reality, *talboti* was both sunken with *E. cajeta* and listed as a full species in their taxonomic list, albeit it was explicitly synonymised in the abstract and main text of the work).

After examination of several specimens of the group from the Indian subcontinent to the Papuan region, including syntypes of *E. talboti*, the specific distinction of this from the other two species in the group can fully be confirmed. External differences (including colouration) between the three species, particularly between males of *E. cajeta* and *E. srivijayana*, are really minor and not always constant, so that identification should better be based on genitalia examination. Nevertheless, no area of geographic overlap between the three species has been ascertained so far.

Diagnostic remarks: *Eudocima talboti* - Both sexes with broader forewings than its relatives, hindwings with blunter, less sharply cornered inner edge of black distal band on vein M1, and smaller discal spot. Postmedial line of forewings well bowed on middle of disc in male. Blackish mottling of female stronger marked than *E. cajeta*, similar to *E. srivijayana* albeit with neater alternation with paler pinkish-beige areas, so that a vaguely banded pattern is more evident. In the male genitalia (Figs 9-12), the valva is neatly triangular in shape, with sharp-cornered albeit slightly projected apex, and juxta consists of medium elongated and wide, sub parallel tapered paired processes reaching half of tegumen. The aedeagus is stout; vesica is small and compact T-shaped, with short branches of unequal length and almost no basal stem; shortest branch is apically tipped by voluminous curved cornutus, while longest bears on inner side a patch of spine-like, basally speculated cornuti, and is tipped by rather flimsy straight cornutus; gonoporal duct opens at very base of vesica stem. In the female genitalia (Fig. 24), the anterior margin of sternum A8 wraps around the ventral lip of ostium bursae and plicates so as to originate a posteriorly produced, short rounded antevaginal lobe overhanging antrum, and two broad subtriangular paramesial, anteriorly projected lobes that fuse internally and laterally with antrum; this is short and broad, approximately trapezoid in outline, and actually sclerotized only at sides; the midventral section of sternum A8 is membranous but bears a small, heavily sclerotized and strongly bulged lamella postvaginalis; ductus bursae very short and relatively wide, leading into strongly sclerotized and folded albeit not ridged cervix bursae; bursa copulatrix slightly displaced laterally with respect to junction with ductus bursae.

Eudocima cajeta - In general, males have fairly slender and comparatively pale forewings with well pronounced apex, tornal hook and sinuous hind margin. In the females, forewings are slender too and their dark mottling somewhat minute and uniform on a pale beige ground color. In the hindwings of both sexes, black markings are not much extended; in consequence of this, the extension of orange is quite broad; the discal spot is well developed albeit fairly narrow at middle because of rather straight or even slightly concave inner margin, and shows deep, fairly acutely pointed "<"-shaped excision along outer margin. In the male genitalia (Figs 14-15) *E. cajeta* has a distinct short tooth-like process projecting from costal margin of valva before broadly rounded apex and juxta consists of very long, slender paired processes, slightly arched inwards distally, which reach base of uncus. The aedeagus is slender; vesica consists of a single tubular, slightly reclinate diverticulum tipped by long straight cornutus; the outer side of diverticulum is distally clothed with a thick bundle of spine-like, basally minutely spiculated cornuti, and gonoporal tube opens just proximally to the bundle from approximately middle length of diverticulum itself. In the female genitalia (Fig. 25) the anterior folded part of sternum A8 wrapping ventrally the ostium bursae projects posteriorly into a conspicuous sclerotized antevaginal plate terminating into paired teeth which protrude beyond segment A8 itself; the middle part of sternum A8 is wholly sclerotized and bears a long pedunculate, overall "spoon-shaped" relief; the antrum is longer than wide; ductus bursae comparatively long and narrow, with sclerotized ridges anteriorly; bursa copulatrix slightly displaced laterally with respect to junction with ductus bursae. Much variability in the shape of the antevaginal plate has been detected after dissections of specimens from the whole species range. A screening on this character is currently being undertaken to assess whether such variability is simply inter-individual or there is some sort of geographic congruence.

Eudocima srivijayana - Forewings of males are of medium width but there is some geographic variation (notably in the Philippines) and they can closely approach in silhouette those of both preceding species. The ground color of forewings in male is generally darker than in *E. cajeta*, thus similar to *E. talboti*, while mottling in females is produced by strong and usually dark blotches, which lead them to show a blackish appearance; in these features they resemble too those of *E. talboti*, although the pattern is somewhat more confuse. The extension of black markings on the hindwings is in both sexes fairly broad. In the male genitalia (Figs 16-17) the very apex of valva prolongs into conspicuous long and sclerotized spine, and juxta is short and broad, with an overall sub-rhomboid shape, its processes being subtriangular, broad-based, and just reaching half of tegumen. The aedeagus is stout; vesica is T-shaped, with branches of unequal length, shorter one is also the widest, it is tipped by long straight cornutus and bears distally thick patch of spine-like, basally minutely spiculated cornuti on outer side; longer branch is the narrowest and bears on inner side a belt of cornuti of increasing size towards the tip; gonoporal tube branches off from vesica stem. In the female genitalia (Fig. 26) the anterior part of sternum A8 is completely folded over sternum itself producing a sort of transverse flap, this flap being actually split into two broad, heavily sclerotized paramesial parts whose external and internal walls are conspicuously ridged horizontally; the middle part of sternum A8 is wholly albeit weakly sclerotized and bears a long cuneate relief; there is neither a median antevaginal process nor a distinct antrum, and ostium bursae opens directly into comparatively short and narrow ductus bursae, whose ridges show some weak sclerotization only at junction with bursa copulatrix; bursa fully aligned with junction with ductus bursae.

Distribution: *Eudocima talboti* - Moluccas (Seram, Halmahera), Waigeo, Numfoor. Prout (1922) tentatively assigned to *E. talboti* a small-sized male in coll. Joicey probably originated from Ambon ("A ♂ in coll. Joicey, from Amboina (?), measuring only 86 mm. evidently belongs to this race…"). This very same specimen has been traced in NHMUK and is actually *E. talboti*, but it has been relabelled in the past by an unspecified person as from "North Ceram ?", likely to make it correspond more precisely with known places for this species (Plate 157 fig. 3).

Eudocima cajeta - India, Sri Lanka, Bhutan, Southern China, Myanmar, Thailand, Vietnam, Andamans. Contrary to Zilli & Hogenes' (2002) indication, the specimen from Malay Peninsula illustrated by Barlow ([1983]: pl. 35, fig. 1) is of *E. srivijayana*. As noted by the very same authors, legends to figures 4-5 by Bänziger (1985: 46-47) are inverted.

Eudocima srivijayana - Peninsular Malaysia, Singapore, Nias, Sumatra, Borneo, Java, Bali, Lombok, Sumbawa, Sumba, Flores, Timor, Sulawesi, Philippines (Panay, Negros, Leyte, Samar, Mindanao). Possibly in the Tanimbar group (1♀, coll. Speidel), but dissections needed.

As noted above, there are no known areas of geographic overlap between the three members of the *cajeta*-group, though it would be interesting to precisely assess the actual boundaries of their distributions to thoroughly reconstruct their diversification in the Indoaustralian Region. The boundary between *E. cajeta* and *E. srivijayana* should occur somewhere along Indochina, possibly in Tenasserim, given that the former has so far been observed up to Central Thailand and Southern Vietnam, while the latter already occurs in the Malay Peninsula. Specimens from Panay and Mindanao have proved after dissections to belong to the Sundanian species, same for others from Sulawesi, thus demonstrating that a substitution between *E. srivijayana* and *E. talboti* actually takes places within Wallacea. Last but not least, the latter has so far been assessed for islands around the Doberai Peninsula (Waigeo, Numfoor = Mefor) but not yet from New Guinea.

Eudocima oliveri sp. nov. (Figs 1-3, 21, plate 158 figs 3-5)

Described here above from Vanuatu.

Eudocima phalonia (Linnaeus, 1763) (Plate 159 figs 1-6, plate 160 figs 1-6)

Phalaena phalonia Linnaeus, 1763. *Centuria Insectorum rariorum:* 28; *Amoenitates Academicae* 6: 411. Type locality: in Indiis. Type material: number and sexes originally unspecified, ♂ lectotype designated by Mikkola & Honey (1993), in LSUK (picture examined).

= *[Phalaena] fullonia* Clerck, [1764]. *Icones Insectorum rariorum* 2: pl. 48, figs [1-4]. Type locality: [in Indiis], after indication by Linné (1763a: 4; 1763b: 387) addressing to forthcoming work by Clerck ([1764]). Type material: same as above, name most likely being a misspelling of *Phalaena phalonia* Linnaeus, 1763.

= *Noctua dioscoreae* Fabricius, 1775. *Systema Entomologiae, sistens insectorum classes, ordines, genera, species, adiectis synonymis, locis, descriptionibus, observationibus:* 593. Type locality: in Indiae orientalis Dioscoreis [= in dioscoreaceous-like plants of Oriental India]. Type material: Fabrician material referable to *Noctua dioscoreae* is in ZMUC (Aurivillius, 1898), but its type status requires probation.

= *Phalaena Noctua pomona* Cramer, [1776]. *De uitlandsche Kapellen voorkomende in de drie Waereld-Deelen Asia, Africa en America by een verzameld en beschreeven* 1: 122 [text], 154 [index], pl. 77, fig. C [name dates from the index]. Type locality: Kust van Coromandel. Type material: number and sexes originally unspecified, but a single female illustrated; ♀ holotype [by likely monotypy], in NHMUK (examined) [specimen hardly restored with wing pieces of other individuals/ species and painted, in all evidence by Felder's technicians during transition in his collection before purchase by L.W. Rothschild].

= *Ophideres obliterans* Walker, [1858]. *List of the Specimens of lepidopterous Insects in the Collection of the British Museum* 13: 1229. Type locality: Navigator's Islands [= Samoa]. Type material: 2 syntypes, sexes originally unspecified, ♂ syntype in NHMUK (examined) (incorrectly noted by Brou & Zilli, 2016 as holotype).

The widespread and most economically important species of *Eudocima*, ranging from the African tropics across the Oriental, SE Palaearctic (but up to the NE as a stray) and Australian regions well into the Pacific, where after a series of parameters it has been ranked as the fourth worst pest by Waterhouse (1997).

Ongoing research is showing that apart from some close relatives well characterised on morphological ground, namely *Eudocima lequeuxi* Brou et Zilli, 2016 (E and SE continental Africa) and *E. oliveri* sp. nov. (Vanuatu), the nominal species articulates into several biotypes whose evolutionary value needs assessment. For instance, the African individuals happen to have the processes of juxta narrower than Indoaustralian ones (Zilli & Hogenes 2002), whereas New Guinean and Pacific populations were shown to have shifted larval host plants from vines of the family Menispermaceae to trees of the genus *Erythrina* (Fabaceae) (Tams 1935; Cochereau 1977; Hammes & Putoa 1986; Muniappan et al. 1994; Fay 1996; Sands & Chan 1996; Reddy et al. 2005). Interestingly, in some more remote areas such as mountains of New Guinea and New Caledonia the Menispermaceae are maintained (Cochereau 1977; Sands & Liebregts 2005), whereas *Erythrina* are also known to be occasionally used in Australia (Tryon 1924). Patterns of local differentiation, however, are likely obscured by phenomena of accidental introduction or long range dispersal, *E. phalonia* being a powerful flyer known to undergo migrations (Sands & Schotz 1991), so that strikingly different forms may be found sympatrically, while others appear to gradually loosen their features when proceeding out of their own core range. This happens to be the case for the Solomon Archipelago, where two sharply different forms of males coexist, one corresponding to the usual *phalonia* male phenotypes widespread across the whole Indoaustralian region, the other restricted to this archipelago only (Plate 159 figs 2-5). The latter show less elongated forewings with more bowed outer margin, darker lilac brown ground color and indistinct streak bisecting the apex. On the hindwings they have more extended dark markings and, on the underside, despite a somewhat more melanistic appearance the discal spot of the hindwings reduces in extension, a circumstance which does not occur in males of the normal form. Males of the exclusively Solomon form have so far been observed in Bougainville, Choiseul, Treasury Is, New Georgia I., Santa Isabel, Nggela (= Florida) Is and Guadalcanal, in the last three locations in sympatry with normal *E. phalonia*. A single male from Guadalcanal shows intermediate features and cannot be comfortably associated with either of the two. Females, in contrast, appear to extensively vary from small dark, homogeneously colored to large pale, variegated individuals in an almost endless combination of sizes and patterns (Plate 160 figs 2-4). Some females also show an unusual extension of honey or golden yellow patches on forewings, a feature seen also in a few specimens from New Ireland in the nearby Bismarck Archipelago. This complex situation, coupled with the fact that no meaningful differences in the genitalia between the various forms was found, leads us to suppose that despite some differentiation there is gene exchange between the various sets of populations and any taxonomic split should better be based on genetic analyses hopefully to come.

Another interesting situation, in which insularity and evolutionary phenomena of founder's effect and genetic drift are likely playing a role, is that possibly occurring in the Samoan Archipelago, from where *E. phalonia* is known since Walker's ([1848]) description of *Ophideres obliterans* and has continuously been recorded over the time (Rebel 1910; Comstock 1963; 1966; Sands & Liebregts 2005). The available syntype of *O. obliterans* and another two old specimens from the archipelago appear as fully characteristic, large-sized normal-patterned *E. phalonia*, whereas more recent material examined by us consists of neatly smaller individuals with a somewhat marked tendency towards reduction of the discal spot of the hindwings (Plate 160 fig. 6).

In the Australian region, *E. phalonia* is widespread all over Wallacea and from New Guinea and Northern and Eastern Australia eastwards on most islands of the intertropical belt (Viette 1948; 1949; Waterhouse & Norris 1987; Davis et al. 2005), although records marginal or extralimital to the intertropical zone are considered to be due to strays or accidental import, e.g. on Lord Howe I., New Zealand and Hawaii (Meyrick 1887; Turner 1918; Holloway 1977; Heu 1986; 1988). The easternmost records in Oceania are from Hawaii (Heu 1986), Kiribati (Davis et al. 2005), Society Islands (Viette 1949) and Rapa I. (1♂, in NHMUK). As a matter of fact, the whole Pacific populations are deemed to be of recent origin from a primary Indomalay-papuan range (Waterhouse 1997), not least because on many islands *Erythrina* trees were deemed of comparatively recent introduction (Cochereau 1977). In reality, a number of *Erythrina* spp. appear to be indigenous in the Pacific, albeit their diffusion was facilitated by man (Stone 1970; Thaman et al. 2000), and also a few endemic species are known (St. John 1956; Barneby & Krukoff 1982; Wagner et al. 1990).

We suspect therefore that the situation is more complex and more waves of colonization and local differentiation may have occurred, with ancestral biotypes possibly still linked to the local Menispermaceae, also in consequence of the discovery of related endemic taxa such as *E. oliveri* and *E. steppingstonia* which likely represent offshoots derived from *phalonia*-like ancestors. Historical data at least on presence of *E. phalonia* in various islands show that its spreading into the Pacific is not a 20th century phenomenon, as the species dates at least from 1848 in Tahiti (J.N.E. Vesco leg.; Viette, 1949), 1858 in Samoa (Walker, [1858]), ante 1884 (NHMUK coll.) and 1886 in Fiji (Druce, 1888) and 1893 in Rapa I. (NHMUK coll.). Waterhouse & Norris (1987) also stated that the African populations of *E. phalonia* would have originated from the primary oriental range, an assertion which may possibly be best verified with a modern phylogeographic analysis.

A genetic characterization of the various populations of *E. phalonia* in Oceania, along with tracking the network of their evolutionary relationships, seems therefore advisable in order to better address control of this fruit pest in the Pacific. These pieces of information would provide a baseline for a more focused targeting of most harmful biotypes of *E. phalonia* with current control measures, including use of biocontrol agents such as egg and larval parasitoids. In fact, these are being released in a number of islands (Muniappan et al. 2004; Sands & Liebregts 2005), but they might turn out detrimental to the survival of other species of *Eudocima* with restricted insular distributions.

***Eudocima steppingstonia* sp. nov.** (Figs 6-8, 23, plate 161 figs 1-3)

Described here above from Fatu Hiva in the Southern Marquesas Islands.

***Eudocima paulii* (Robinson, 1968)** (Plate 162 figs 1-5)

Othreis paulii Robinson, 1968. *The Entomologist's Record and Journal of Variation* 80 (10): 251, pl. 14, fig. [unnumbered], text-fig. 3. Type locality: Nandarivatu. Type material: ♂ holotype [by original designation], in NHMUK (examined).

A very variable species, endemic to Fiji Islands (Viti Levu and Vanua Levu).

***Eudocima jordani* (Holland, 1900)** (Plate 163 figs 1-2)

Ophideres jordani Holland, 1900. *Novitates zoologicae* 7 (3): 570. Type locality: [Buru]. Type material: 2♂ syntypes, in CMNH.

This unmistakable species ranges from Sulawesi, the Moluccas (Halmahera, Buru, Seram and Kei Islands eastwards to New Guinea, NE Australia (Queensland), the Bismarck Archipelago (Rook I., New Britain, New Ireland, New Hannover), Nissan I. and New Caledonia.

***Eudocima dividens* (Walker, [1858])** (Plate 163 figs 3-4)

Ophideres dividens Walker, [1858]). *List of the Specimens of lepidopterous Insects in the Collection of the British Museum* 13: 1228. Type locality: Java. Type material: sex originally unspecified but description only compatible with female sex, ♀ holotype [by monotypy], in NHMUK (examined).

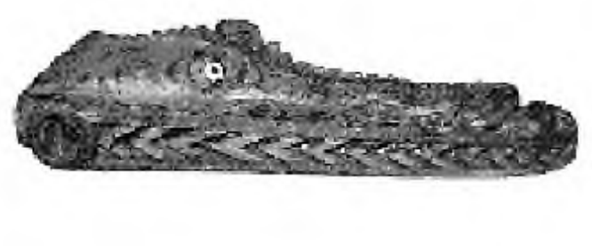
A SW Asian element occurring in the Philippines and in Sundaland from Peninsular Malaysia to Java whose distribution extends in Wallacea to the island of Sulawesi.

***Eudocima salaminia* (Cramer, [1777])** (Plate 164 figs 1-5)

Phalaena Noctua salaminia Cramer, [1777]. *De uitlandsche Kapellen voorkomende in de drie Waereld-Deelen Asia, Africa en America by een verzameld en beschreeven* **2**: 117 [text], 150 [index], pl. 174, fig. A [name dates from the index]. Type locality: China; wrongly recorded by Zilli & Hogenes (2002) as Suriname. Type material: number and sexes originally unspecified, probably lost.

Widespread all over the Indoaustralian region from India and Sri Lanka to the Central Pacific (Fiji, Samoa and Tonga) (Viette 1948, and original observation) and in the Eastern sector of the Palaeartic, as far north as Korea and Japan, it also been recorded from Madagascar (e.g. Hampson 1894), likely on the basis of strays or spurious specimens and not confirmed from that island anymore (cf. Viette 1990). Another option is that Hampson relied on a specimen preserved in NHMUK labelled as from "Mad", an abbreviation which could well stand also for "Madras". In the old literature it has also been repeatedly recorded from continental Africa, mostly as subsequent quotations based on Hampson's (1902) from Grahamstown (South Africa), but this record has explicitly been recognized by Pinhey (1975) as due to error. We are unaware of any reasons for its quotation from Central Africa by Kononenko & Pinratana (2005).

The species appears quite homogeneous in habitus all over the Oriental and Palaearctic parts of its range, and in the most western districts of the Australian one, from Wallacea to New Guinea, Australia and the Bismarck Archipelago. In the Solomon Archipelago, however, populations are constantly characterised by a duller, brownish rather than greenish color of the forewing subtriangular patch, a much broader black distal band of the hindwings, and less elongated shape of forewings. Individuals with this pattern have so far been observed in Bougainville, Choiseul, Treasury Is, New Georgia group (Vella Lavella, Kulanbangra (= Kolombangara) I., New Georgia), Nggela (= Florida) Is, Santa Isabel and Guadalcanal, where all examined specimens conform to this phenotype. In directly adjoining islands such as Nissan I. and Rennel I. the individuals correspond to the western phenotype. The genitalia of these specimens, however, did not reveal any meaningful differences with respect to the normally-patterned *E. salaminia* from other areas of the species range. We refrain from describing a formal subspecies to depict this otherwise well-characterized and geographically consistent set of populations because some of their features happen to occur, albeit more weakly expressed, in other more southern islands to the Solomons such as New Caledonia, Vanuatu and Fiji. This evidence leads us to suppose that in the Pacific area there are ongoing faunal exchanges which may contribute to the diffusion of particular genetic traits which originated in semi-isolated populations in different islands. In Tonga and Samoa the individuals



appear fully normally-patterned again.

***Eudocima nigricilia* (A.E. Prout, 1924)** (Plate 163 figs 5-6)
Eumaenas salaminia nigricilia A.E. Prout, 1924. *The Bulletin of the Hill Museum* 1 (3): 449. Type locality: Dutch New Guinea: Mount Kunupi, Menoo Valley, Weyland Mountains, 6,000 feet. Type material: ♂ holotype [by original designation], in NHMUK (examined).

So far known from New Guinea only. Incorrectly ranked as a subspecies of *Eudocima salaminia* (Cramer, [1777]) by Kononenko & Pinratana (2005).

***Eudocima materna* (Linnaeus, 1767)** (Plate 165 figs 1-2)
Phalaena materna Linnaeus, 1767. *Systema Naturae (Editio duodecima reformata)* 1 (2): 840. Type locality: in Indiis. Type material: number and sexes originally unspecified, but description compatible with female only; ♀ lectotype designated by Mikkola & Honey (1993), in LSUK (picture examined).
= *Noctua hybrida* Fabricius, 1775. *Systema Entomologiae, sistens insectorum classes, ordines, genera, species, adiectis synonymis, locis, descriptionibus, observationibus:* 593. Type locality: India… nova Hollandia. Type material: number and sexes originally unspecified, but description compatible only with females and based on at least two syntypes; Fabrician material referable to *Noctua hybrida* is at ZMUC (Zimsen 1964), but its type status requires probation, ♀ syntype (ex coll. Banks) in NHMUK (examined).
= *Ophideres chalcogramma* Walker, 1865. *List of the Specimens of lepidopterous Insects in the Collection of the British Museum* 33: 937. Type locality: Zambesi River. Type material: originally unspecified number of male(s), likely one; types not traced and probably lost.

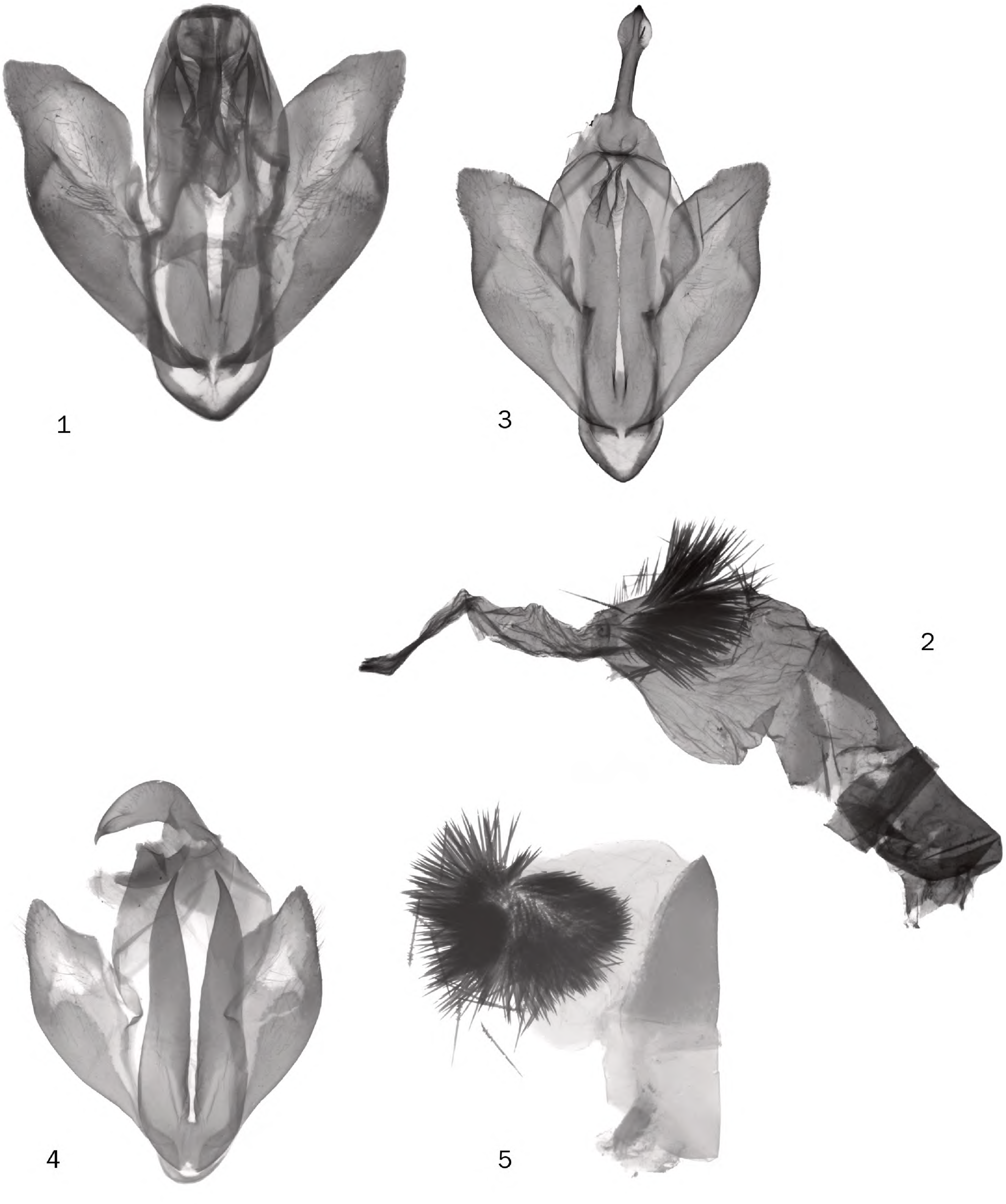
Widespread in the African, S Palaearctic and Indoaustralian regions up to the Central Pacific, in some areas of its vast range the species seems quite scarcer than in others, so there is a particular paucity of records from east of the Indian subcontinent to the Philippines in the north and New Guinea in the east, whereas the species seems to become more common in Australia and the Pacific. This species is replaced in the Americas by the vicariant *Eudocima apta* (Walker, [1858]).

***Eudocima martini* sp. nov.** (Figs 18-19, 27-28, plate 165 figs 3-5)

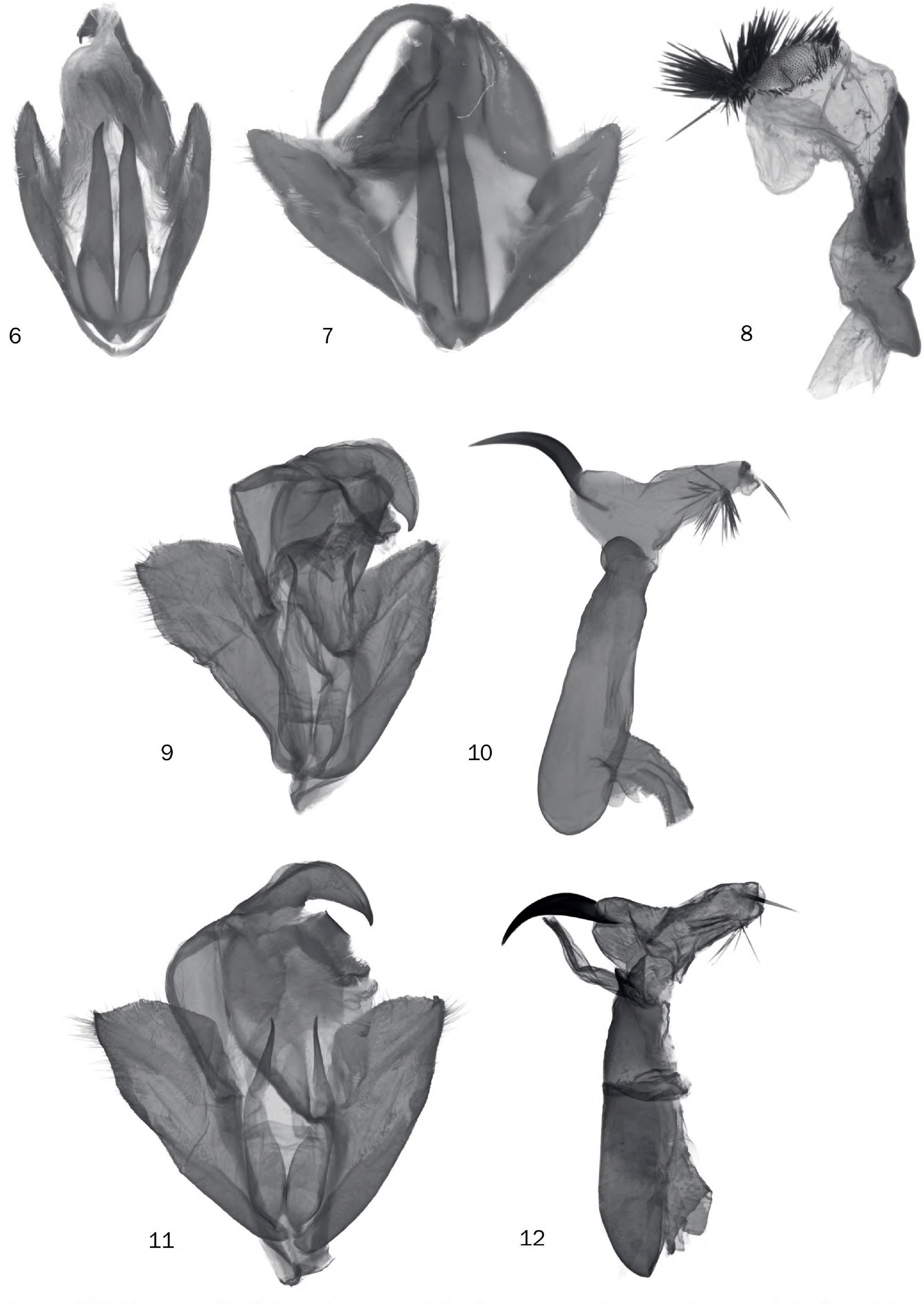
Described here above from the Solomon Archipelago.

***Eudocima kuehni* (Pagenstecher, 1886)** (Plate 161 fig. 4-6, plate 166 fig. 5)
Ophideres kühni Pagenstecher, 1886. *Jahrbücher des nassauischen Vereins für Naturkunde* 39: 137 (as *kühni*, incorrect original spelling), pl. 10, fig. 6 (as *kühnii*, misspelling). Type locality: Neu-Guinea. Type material: ♂ holotype [by original designation], incorrectly stated in the original description to be a female, in MWNH.
= *Lagoptera pratti* Bethune-Baker, 1906 **syn. rev.** *Novitates zoologicae* 13 (2): 260. Type locality: Mafalu, 6000 ft. Type material: ♂ holotype [by monotypy], in NHMUK (examined).

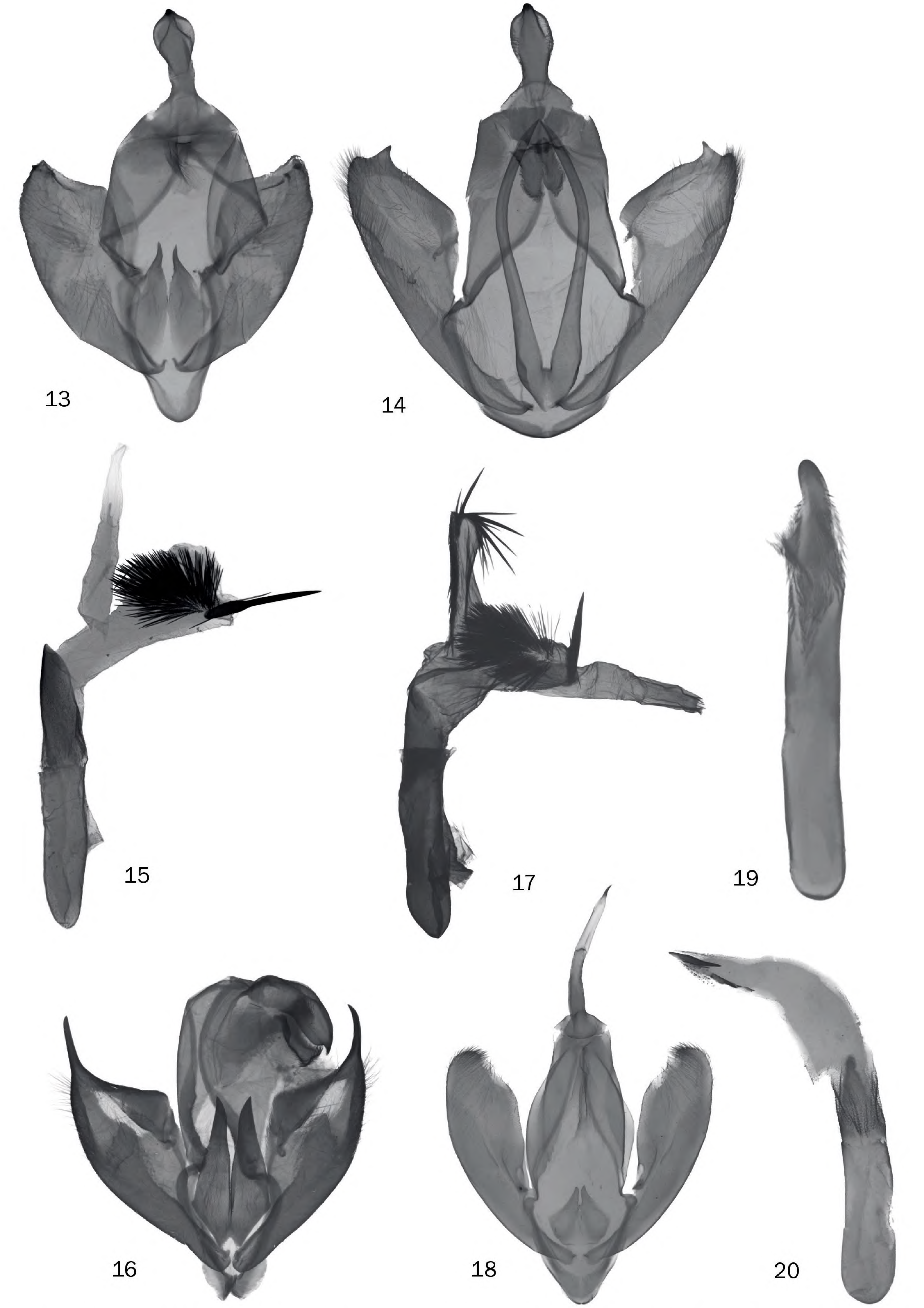
Lagoptera pratti Bethune-Baker, 1906 was described on the basis of a male specimen from Mafalu, New Guinea (Bethune-Baker, 1906). The outstanding markings of the holotype never left any doubt about the fact it was conspecific with the species that had before been named as *Ophideres kuehni* Pagenstecher, 1886, a strongly sexually dimorphic species from the Papuan region (Pagenstecher, 1886). In fact, this is possibly the only one out of all the world species of *Eudocima* that show sexual dimorphism in which the male is more strikingly patterned than the female, a fact that also explains the original Pagenstecher's (1886) mistake about the sex of the holotype. Accordingly, *Lagoptera pratti* was sunken into synonymy with *Ophideres kuehni* and combined as such e.g. in Poole (1989) and Zilli & Hogenes (2002). In the list by Zaspel & Branham (2008), however, "*Eudocima pratti*" was raised to species status. This happened in consequence of the examination by these authors of a series of *E. prolai* Zilli, Hogenes, 2002 in a temporary drawer of the supplementary collection at the NHMUK which was bearing an external label "*pratti*", so they assumed that "*E. pratti*" was a completely differently looking species from *E. kuehni*. In reality, the holotype of *Lagoptera pratti* was available in the main collection, always at the NHMUK, and this unambiguously corresponds to a male *E. kuehni*, whereas *E. prolai*, which had however been maintained as valid by Zaspel & Branham (2008), is a markedly different species (see above). The fact that the holotype of *Lagoptera pratti* is actually the specimen illustrated here (Plate 161 fig. 5) is further demonstrated by the existence of a portrait of its among those commissioned by G.F. Hampson on types which were not available to him during the preparation of his manuscripts (Plate 166 fig. 5). Interestingly, in addition to the unusual condition of the expression of sexual dimorphism in *E. kuehni*, this species shows several anomalous characters with respect to other *Eudocima*, so its actual systematic placement within this genus has to be con-



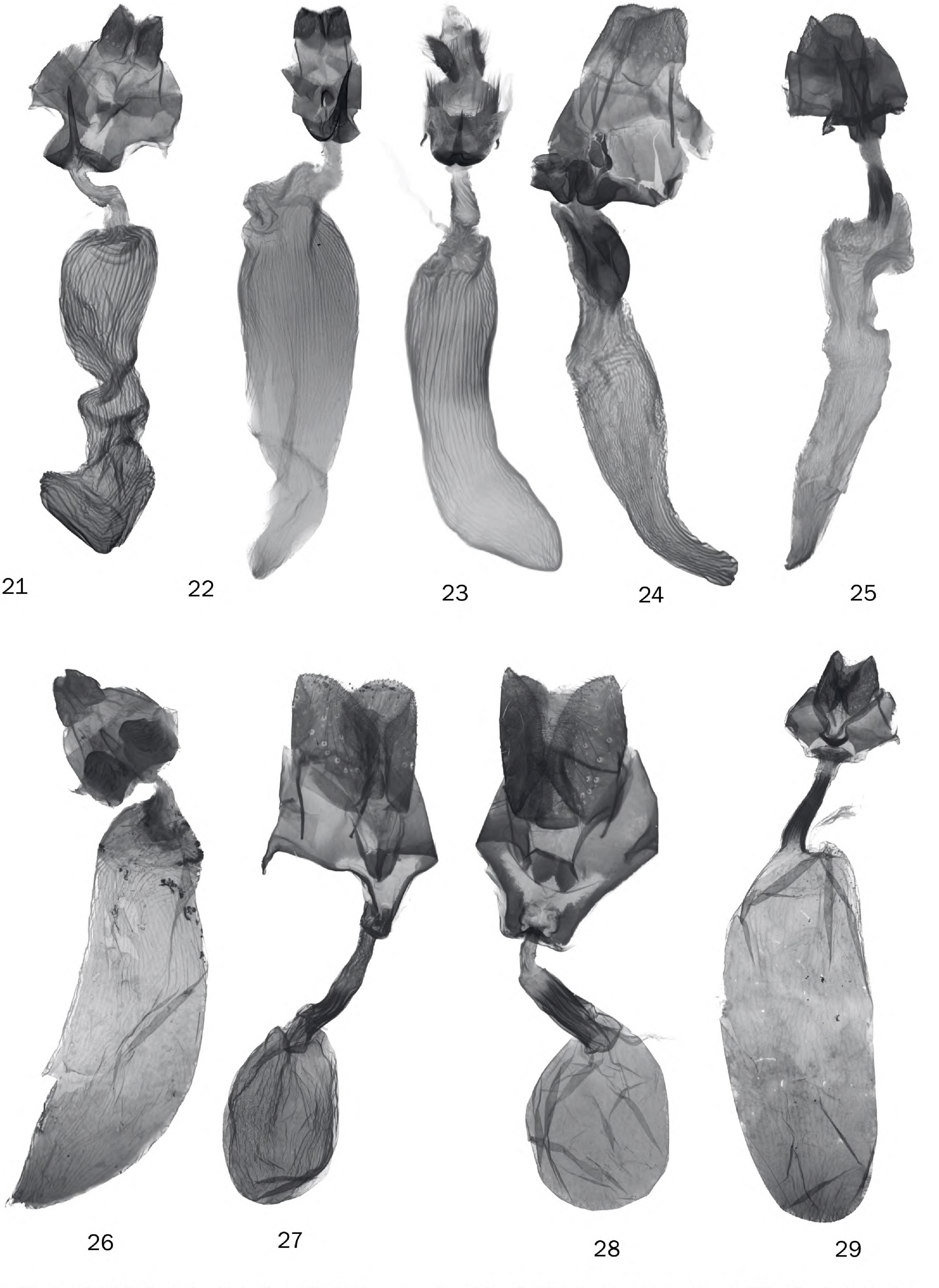
Figures 1-5. Male genitalia of *Eudocima* species. 1-3 – *E. oliveri* sp. nov.: 1 – Holotype, genital capsula; 2 – ditto, aedeagus; 3 – Paratype, genital capsula; 4-5 –*E. phalonia* (L., 1763), Solomon Islands: 4 – Genital capsula; 5 – aedeagus.



Figures 6-12. Male genitalia of *Eudocima* species. 6-8 – *E. steppingstonia* sp. nov., holotype: 6-7 – Genital capsula; 8 – Aedeagus; 9-12 –*E. talboti* (A.E. Prout, 1922): 9 – Syntype, genital capsula; 10 – ditto, aedeagus; 11 – Specimen from Mefor, genital capsula; 12 – ditto, aedeagus.



Figures 13-20. Male genitalia of *Eudocima* species. 13 & 20 – *E. paulii* (Robinson, 1968), Fiji: 13 – Genital capsula; 20 – Aedeagus; 14-15 – *E. cajeta* (Cramer, [1775]), Sri Lanka: 14 – Genital capsula; 15 – Aedeagus; 16-17 – *E. srivijayana* (Bänziger, 1985), Sulawesi: 16 – Genital capsula; 17 – Aedeagus; 18-19 – *E. martini* sp. nov., holotype: 18 – Genital capsula; 19 – Aedeagus.



Figures 21-29. Female genitalia of *Eudocima* species. 21 – *E. oliveri* sp. nov., paratype; 22 – *E. phalonia* (L., 1763), Malay Peninsula; 23 – *E. steppingstonia* sp. nov., paratype; 24 – *E. talboti* (A.E. Prout, 1922), Halmahera; 25– *E. cajeta* (Cramer, [1775]), Thailand; 26 – *E. srivijayana* (Bänziger, 1985), Sumatra; 27 – *E. martini* sp. nov., paratype; 28 – *E.* cf. *martini* sp. nov. Guadalcanal; 29 – *E. paulii* (Robinson, 1968), Fiji.

sidered as temporary.

So far known from the Moluccas (Seram), Kei Islands, New Guinea, Supiori I., Rook I., New Britain, Goodenough I. and Fergusson I.

[*Eudocima princeps* Boisduval, 1832 **nomen dubium**]

Ophideres princeps Boisduval, 1832. *Voyage de découvertes de l'Astrolabe exécuté par ordre du Roi, pendant les années 1826-1827-1828-1829, sous le commandement de M. J. Dumont d'Urville. Faune entomologique de l'Ocean Pacifique 1. Lépidoptères:* 245. Type locality: Nouvelle-Guinée, environs de Dorey. Type material: unspecified, probably lost.

The contradictory combination of characters in the original description of *Ophideres princeps* by Boisduval (1832), hardly compatible with any species of *Eudocima* from the Papuan region, was thoroughly discussed by Zilli & Hogenes (2002). As a matter of fact, the name has been variously interpreted and associated with different species of *Eudocima*, also from other zoogeographical regions. In the absence of any types, the only possible solution was that of ranking the name as nomen dubium (Zilli & Hogenes, 2002). Nonetheless, Zaspel & Branham (2008) followed directly Poole (1989) and listed it again as a synonym of *phalonia*. As no new evidence in support for this interpretation has so far been found, the rationale for maintaining this as a nomen dubium is still fully in place, and we thus remove it from synonymy with *Phalaena phalonia* Linnaeus, 1763.

It should be noticed that the generic name *Ophideres* Boisduval, 1832, long used for many of the species currently treated within *Eudocima*, is based on *Ophideres princeps* after monotypy, but the fact that this is an unrecognised species has no direct bearing on nomenclature of the group as long as *Eudocima* Billberg, 1820 takes priority and there are some other older synonyms available.

Discussion and conclusion

So far 21 species of *Eudocima* have been assessed to occur from Wallacea eastwards to the Central Pacific. Contrary to the situation at the beginning of this work, the pattern of species richness of the genus in the area turned out quite more balanced between the two sides of the Australian region. In fact, at the time of Viette (1948) the open Pacific was thought to have been colonized only by three widespread species, namely *E. salaminia*, *E. phalonia* and *E. materna*. Subsequently, Robinson (1968) discovered the Fijian endemic, *E. paulii*. This one and the newly identified *E. oliveri* sp. nov. from the Vanuatu and the far eastern *E. steppingstonia* sp. nov. show that also the Pacific has its own component of richness in species of *Eudocima*. The latter two are clearly members of the *phalonia*-group, present with *E. phalonia* itself in the area, but the strongly modified structural features of *E. steppingstonia*, notably its most extraordinary uncus, demonstrate antiquity of presence of the group even in the Central Pacific. As discussed in the special part, it was also shown that the situation of nominotypical *phalonia* in the Pacific is possibly more complex than suspected so that a better knowledge of the genetic structure and relationships between the various populations of this fruit-piercing moth should better be gained. In fact, this would help more selective tuning of current control measures in the area in order to prevent that less harmful strains and, ultimately, extremely localised insular endemics such as those accounted on here will be affected.

From a biogeographical point of view worth of note is that species of *Eudocima* show a variety of distribution patterns in the Wallacean-Australian region, but there are none whose limits fully matches with Wallace's line. There are widespread, almost subcosmopolitan elements such as *E. phalonia* and *E. materna*. Also *E. salaminia* is similarly widespread, and with a greater extension into the E Palaearctic, although its presence in the Afrotropical region has never really been confirmed. There are Melanesian endemics restricted to single archipelagos (*E. oliveri*, *E. martini* and *E. paulii*), remote far Pacific relics (*E. steppingstonia*), strictly Papuan elements (*E. prolai* and *E. nigricilia*) or Papuan-centered elements extended to the Bismarck archipelago (*E. muscigera*) and Australia (*E. iridescens*).

Another Australo-Papuan element in the wide sense, *E. jordani*, actually stretches from Wallace's Line eastwards to the Bismarck Archipelago, and southwards to Northeast Australia, but it only occurs in north Wallacea (Sulawesi, Moluccas), and is actually missing in the southern district of this region. *Eudocima kuehnei* is similarly centered on the Papuan region but its range is more contracted and does not extend west of the Moluccas and in Australia. Other elements are either Moluccan, viz. *E. caesar* and *E. talboti*, although records of the latter from Waigeo and the Cenderawasih Bay make its presence in the Doberai Peninsula likely, broadly Indoaustralian (*E. cocalus*, *E. aurantia*, the latter also in the SE Palaearctic) or essentially oriental species which extend into Wallacea albeit only in part, viz. *E. discrepans*, *E. homaena*, *E. srivijayana* and *E. dividens*. It should be stressed, however, that after its current appreciation the genus is possibly heterogeneous, with several lineages sometimes corresponding with the old generic concepts of its synonymous names, whose phylogenetic relationships should be assessed. This analysis would be required in order to properly appreciate radiation of the group in the study area. Preliminarly, if we consider species pairs or groups of clearly related taxa, they usually show strict vicariance patterns. This is the case within the pairs *E. discrepans-E. muscigera* and *E. hypermnestra-E. cocalus* (but see comments in the special section to the latter), or the almost geographically regular substitutions which take place among *E. cajeta*, *E. srivijayana* and *E. talboti* or *E. homaena*, *E. caesar* and *E. iridescens*. In two cases we seem to have full overlap between related species, they are *E. salaminia* and *E. nigricilia* in New Guinea and *E. oliveri* and *E. phalonia* in the Vanuatu. In the latter instance, however, we still need final probation of the various islands on which the two actually coexist. Diversification has thus seemingly followed either allo-parapatric or sympatric models, pathways which can both be traced also in the differentiation shown by *E. salaminia* and *E. phalonia* in the Solomon archipelago. Environmental heterogeneity such as in New Guinea or multi-colonization events such as in the case of smaller islands are the most likely determinants of sympatric occurrences of close allies.

Despite our insights into all species from the Wallacean-Australian region the identity of the original concept of *Ophideres princeps* Boisduval, 1832 unfortunately remains in doubt, nonetheless that of another long standing nomen dubium, *Ophideres caesar* C. Felder, 1861, could eventually be resolved following the discovery of a so far unrecognised syntype.

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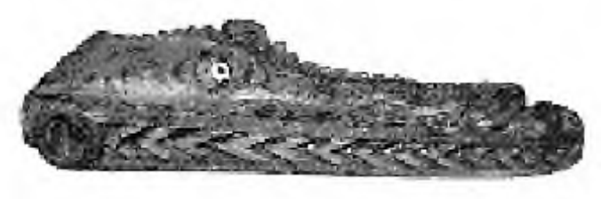
rohwedderi, *Ophiotettix* 570
rufus, *Bucharis* 420

sahu, *Macratria* 482
sangirensis, *Aprosictus* 341
sanguinea, *Ophiotettix* 570
schapinae, *Ophiotettix* 571
Schawalleria subgen. nov., *Trimenus* 407
semiflavum, *Porrostoma* 400
separanda, *Moussonia* 198
sexpunctatus, *Aprosictus* 342
sigwaltae, *Missacoris* 77
silvicultrix, *Palaina* (s. l.) 259
simonthomasi, *Cyana (Clerckia)* 595
slapcinskyi, *Diplommatina* (s. l.) 184
slapcinskyi, *Palaina* (s. l.) 260
soleae, *Orphinus* (s. str.) 318
solitaria, *Amystrops (Amystrops)* 405
sparselamellata, *Palaina* (s. l.) 262
spungisi, *Argiolestes* 358
stallei, *Ophiotettix* 572
steppingstonia, *Eudocima* 635
storozhenkoi, *Ophiotettix* 573
strigicollis, *Phainodina* 420
subbrevicollis, *Ophiotettix* 574



tamarau, *Chariochilus* 463
tanimbarensis, *Palaina* (s. l.) 263
telefominensis, *Ophiotettix* 575
telnovi, *Cladophorus* 378
telnovi, *Diplommatina* (s. l.) 186
telnovi, *Endelus* (*Papuadelus*) 350
telnovi, *Epuraea (Haptoncus)* 404
telnovi, *Palaina* (s. l.) 263
telnovi, *Pyrrhalta* 421
telnovi, *Scaphisoma* 415
telnovi, *Stethotes* 420
telnovi, **C***oenobius* 419
tenuis, *Ophiotettix* 575
ternatensis, *Aprosictus* 343
tertius, *Cladophorus* 381
thomasrinteleni, *Palaina* (s. l.) 264
thoracica, *Phainodina* 421
timorensis, *Diplommatina* (s. l.) 188
torricelli, *Moussonia* 200
toxopei, *Ophiotettix* 576
tricoloripennis, *Cautires* 392
trimaculata, *Sutrea* 425
turschi, *Baitetacoris* 73

uperensis, *Metriorrhynchus* 394

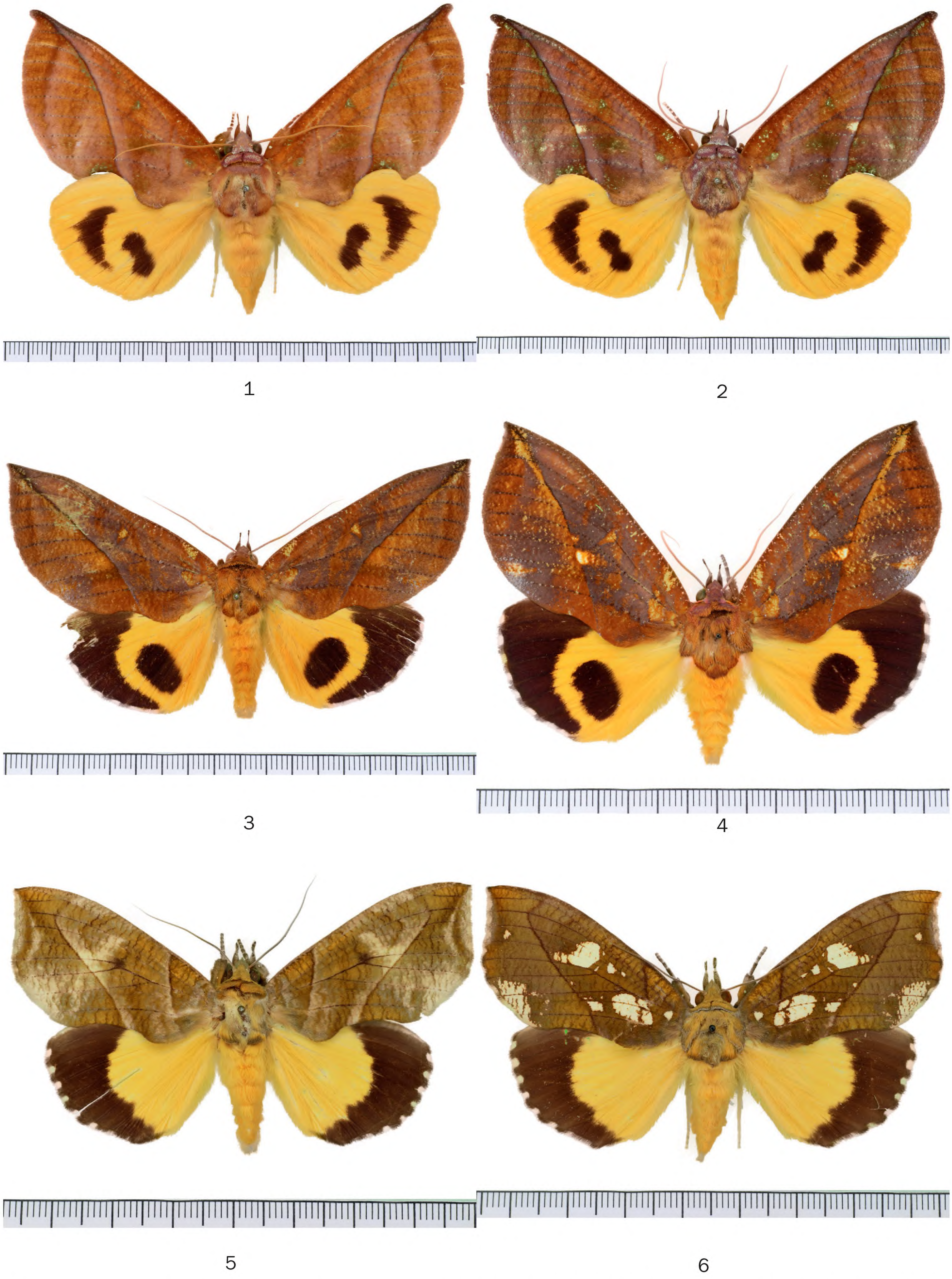
variicornis, *Pseudodontocerus* 386
vermeuleni, *Palaina* (s. l.) 265
vikhrevi, *Metrioguinus* 366
villosus, *Pseudodontocerus* 387
viridiaenea, *Manobia* 424
vitiosus, *Metriorrhynchus* 395

waigeo, *Palaina* (s. l.) 266
waigeoensis, *Diplommatina* (s. l.) 189
wawiyai, *Palaina* (s. l.) 267
weigeli, *Cladophorus* 379

yamdena, *Palaina* (s. l.) 269

zhengi, *Sabactiopus* 109
zwieri, *Cyana (Cryptanaema)* 602

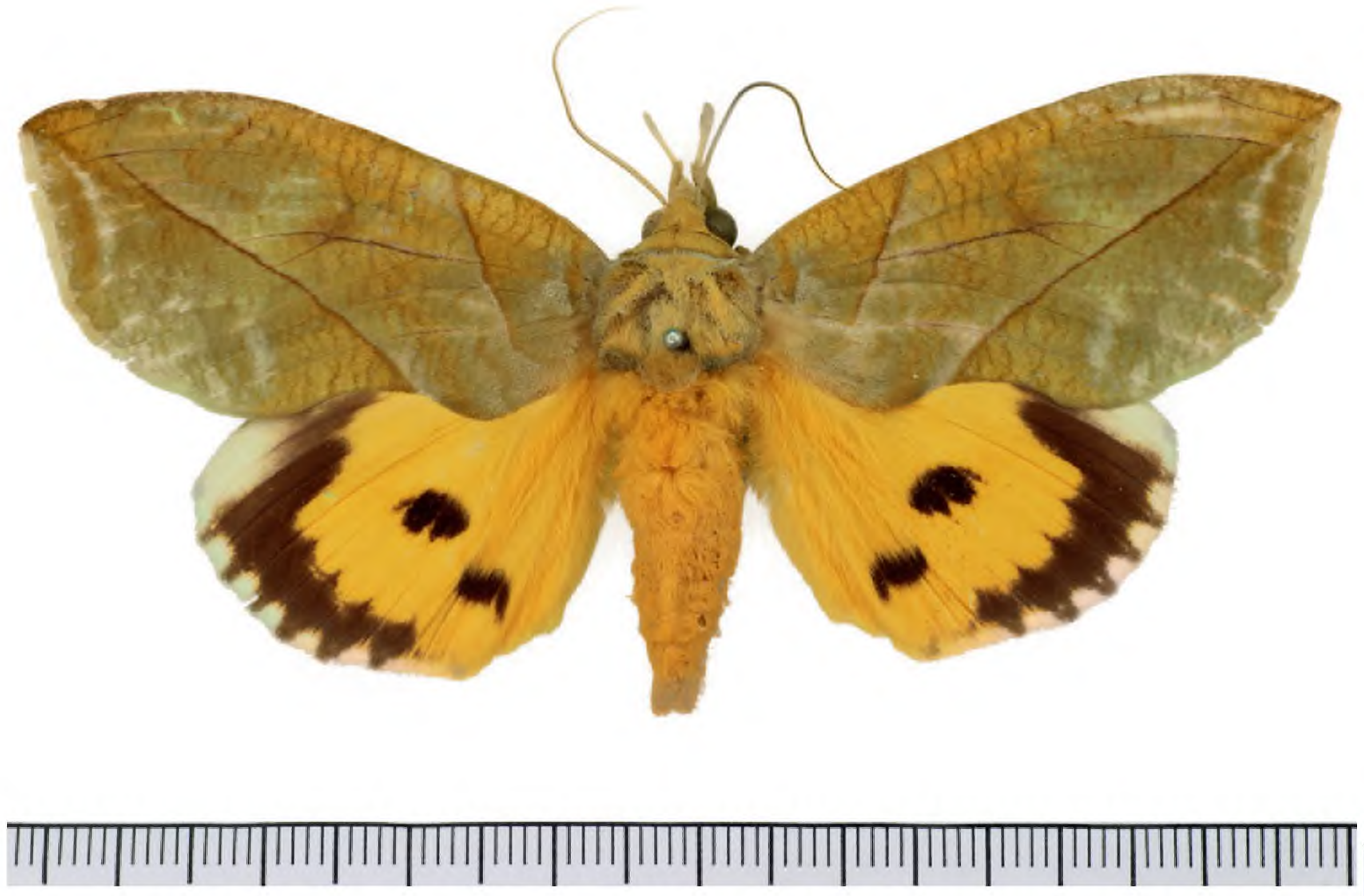
Plate 152



Figures 1-6. Habitus of *Eudocima* species. 1 – *E. aurantia* (Moore, 1877), ♂, Sudest I.; 2 – ditto, ♀, Sudest I.; 3 – *E. prolai* Zilli, Hogenes, 2002, ♂, New Guinea; 4 – ditto, ♀, New Guinea; 5 – *E. cocalus* (Cramer, [1777]), ♂, Vulcan I.; 6 – ditto, ♀, Fergusson I.

Plate 153

ZILLI, A., BROU, V.A., KLEM C., ZASPEL, J.: The *Eudocima* Billberg, 1820 of the Australian Region (Lepidoptera) …



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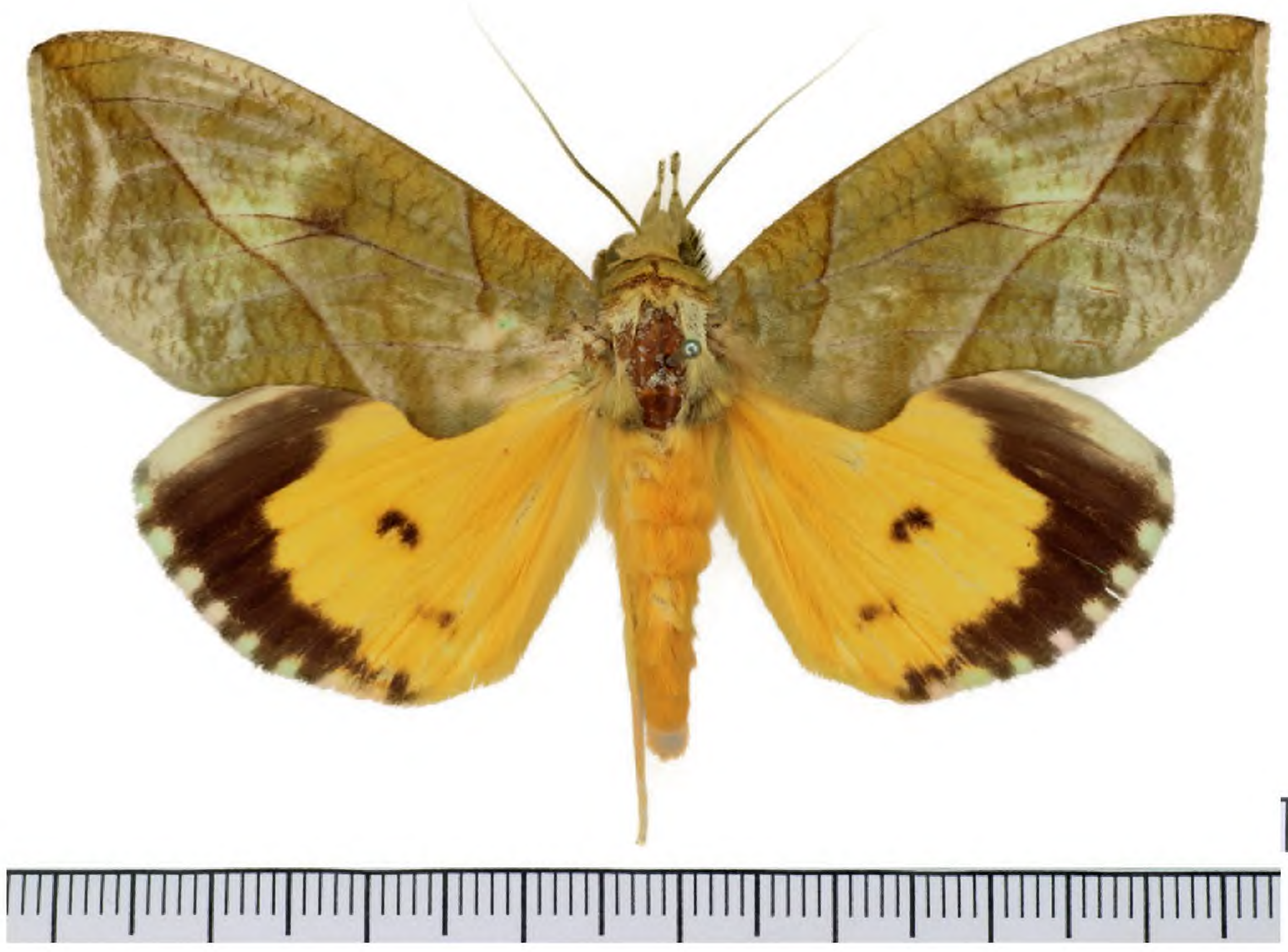

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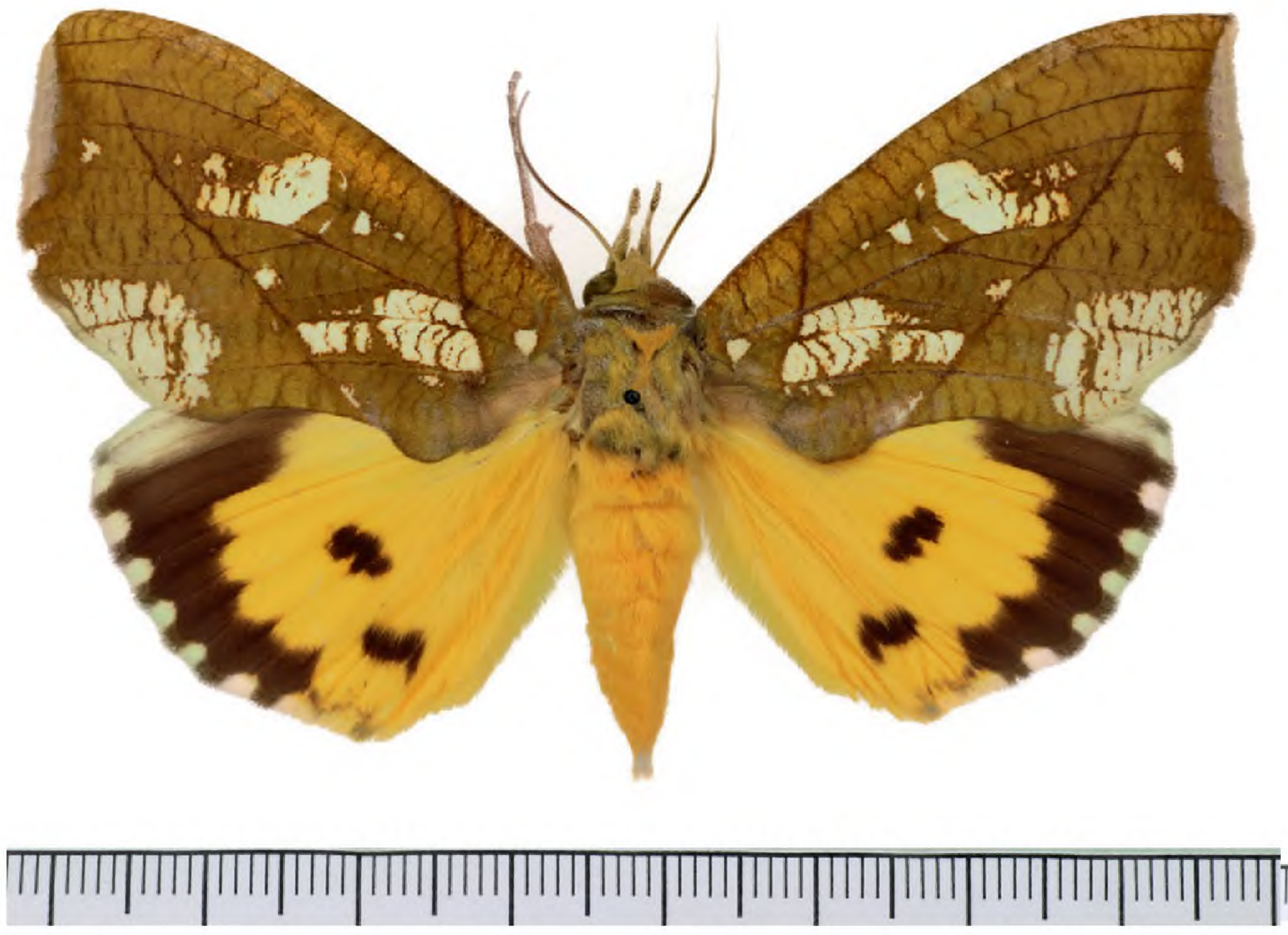

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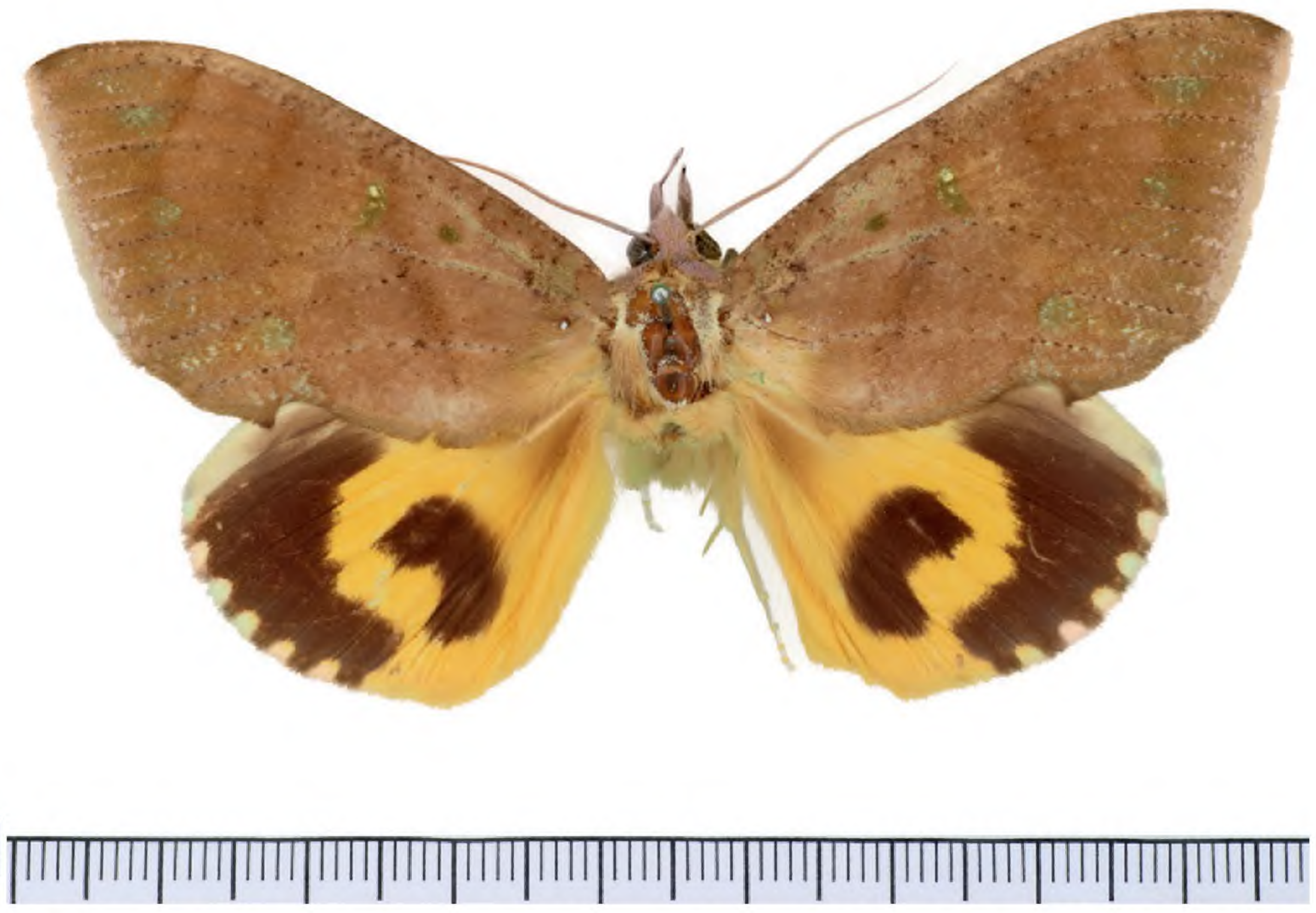

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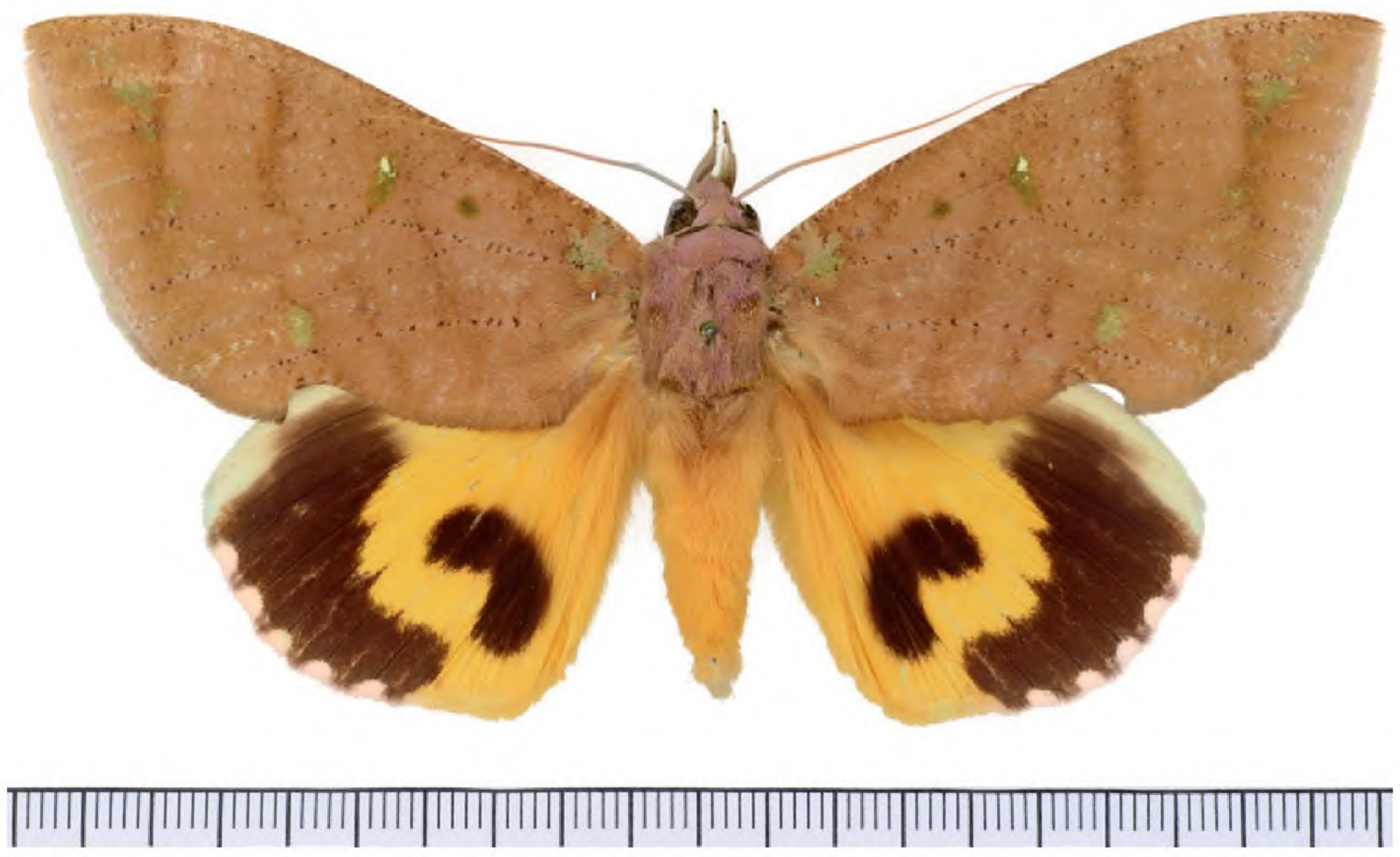

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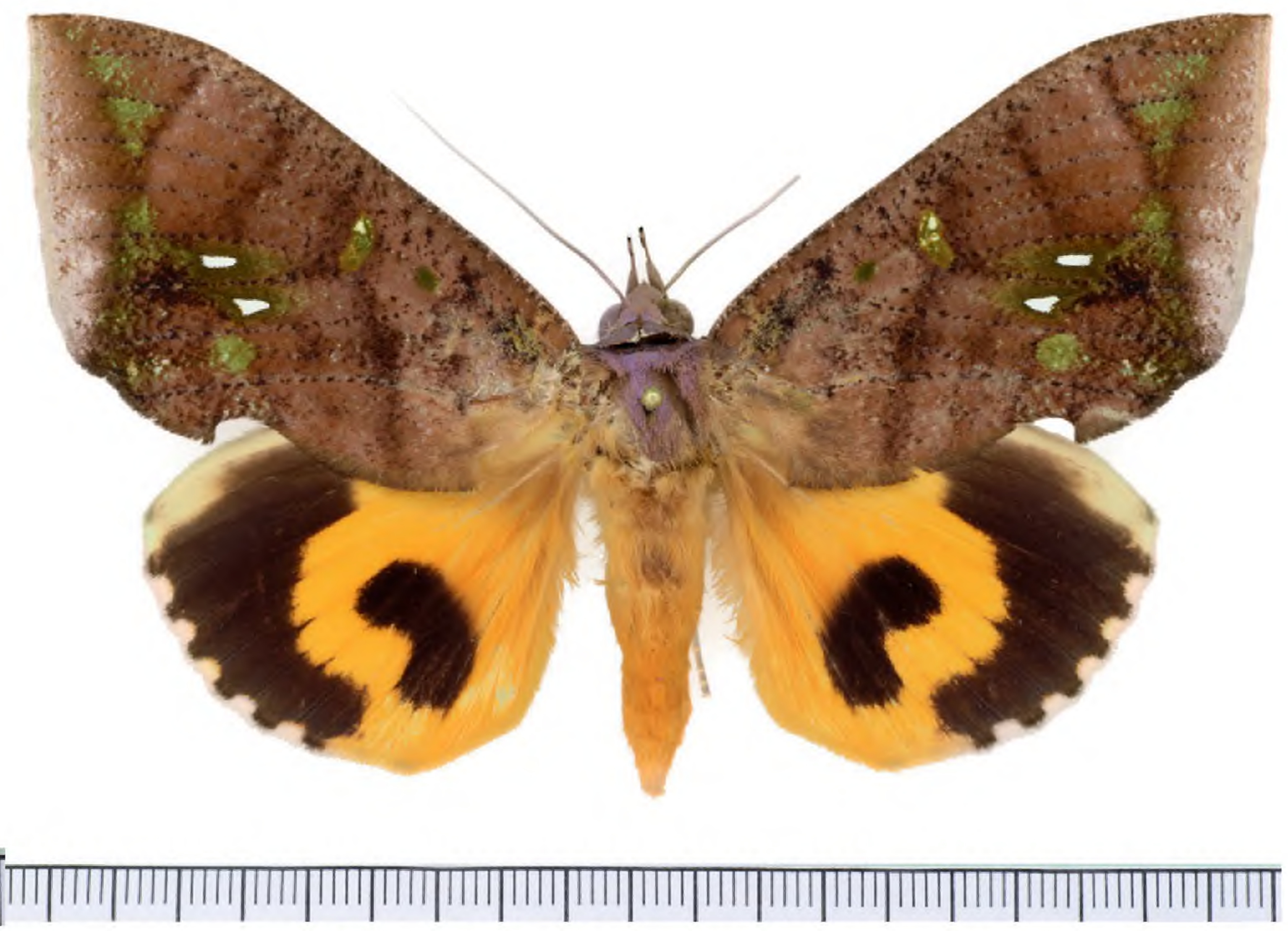

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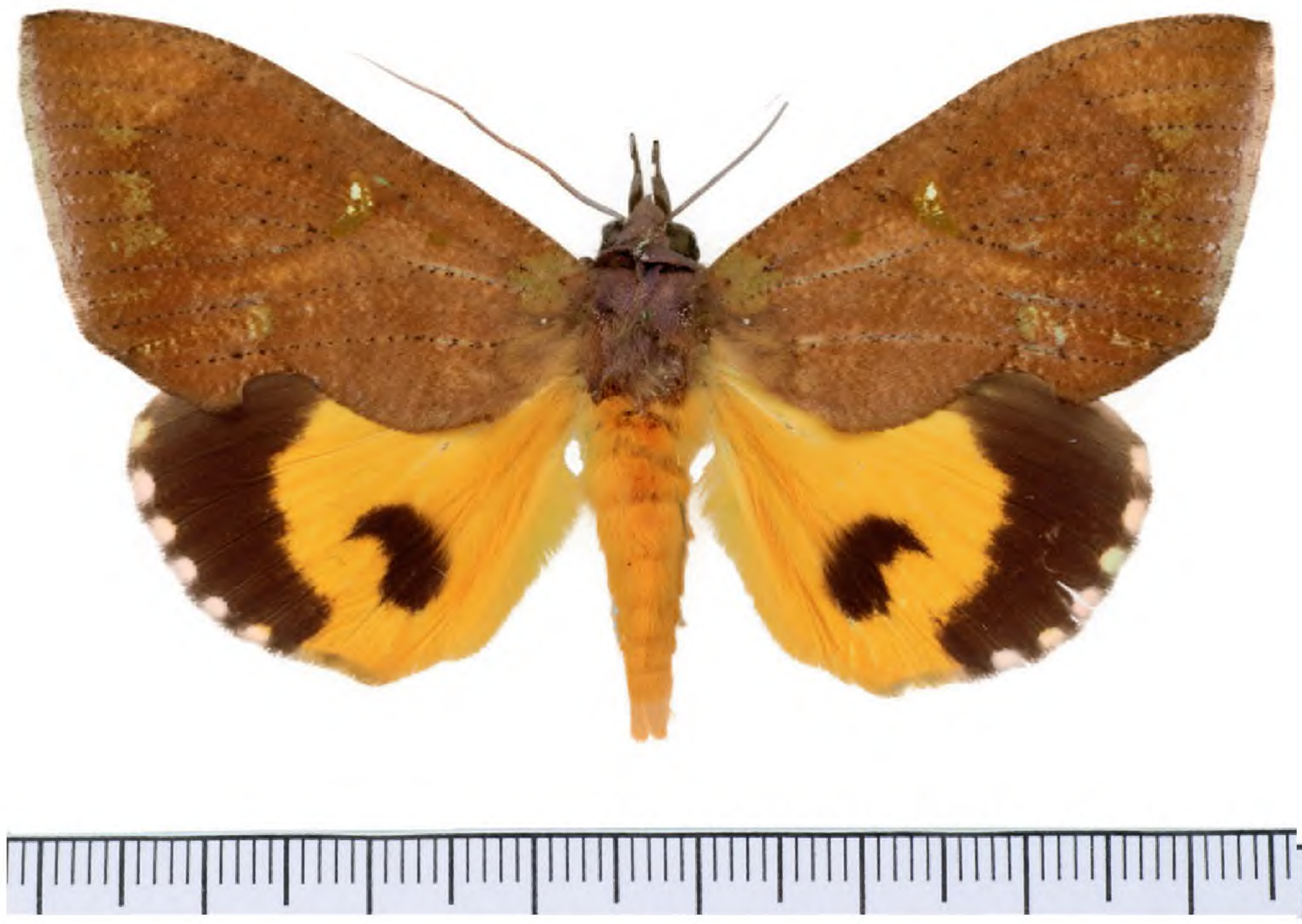
Figures 1-6. Habitus of *Eudocima* species. 1 – *E. hypermnestra* (Stoll, [1780]), ♂, India; 2 – ditto, ♂, Vietnam; 3 – ditto, ♀, "Malaya"; 4 – *E. discrepans* (Walker, [1858]), ♂, Sumatra; 5 – ditto, ♂, Lombok I.; 6 – ditto, ♀, Borneo.

Plate 154



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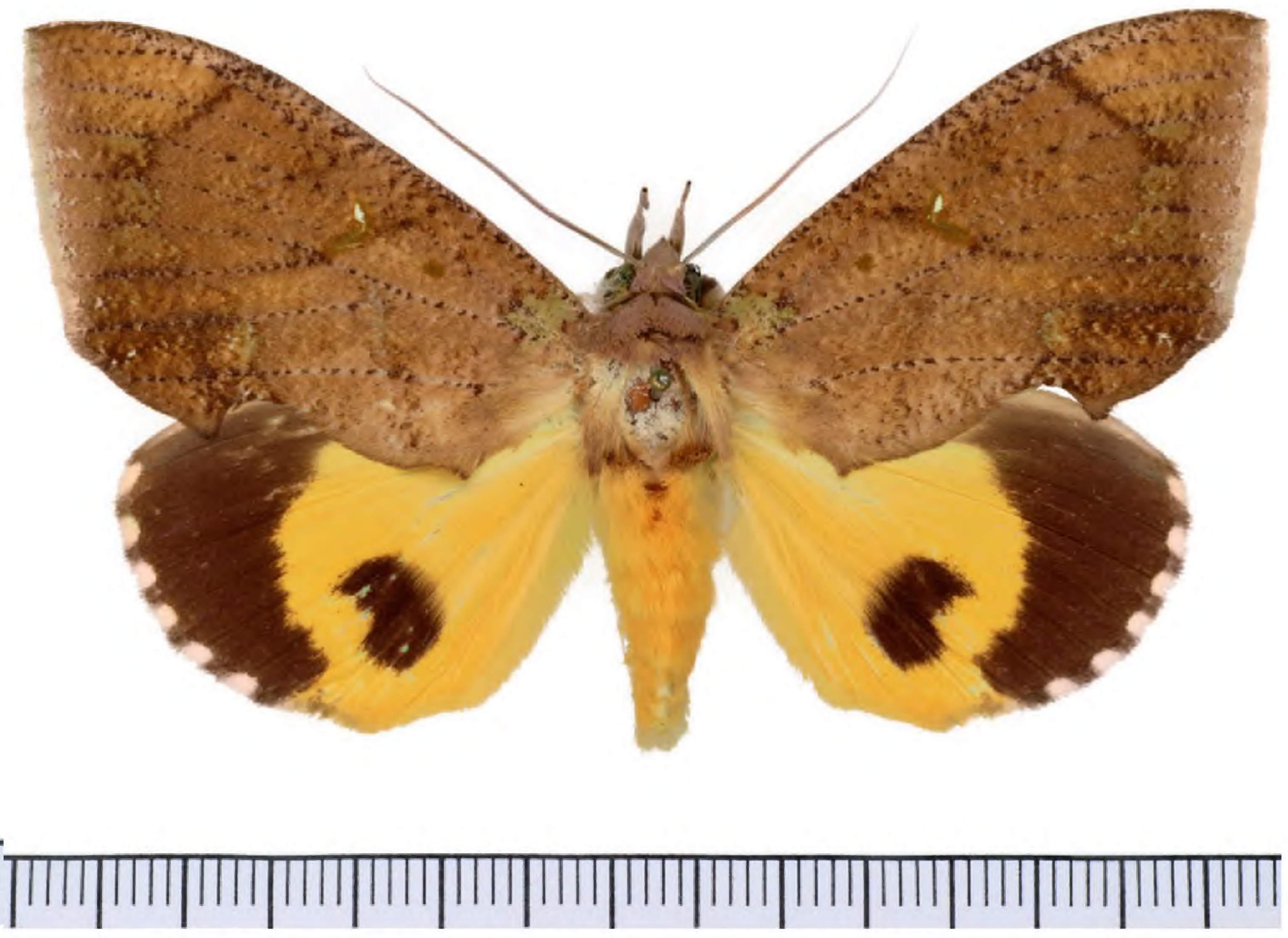

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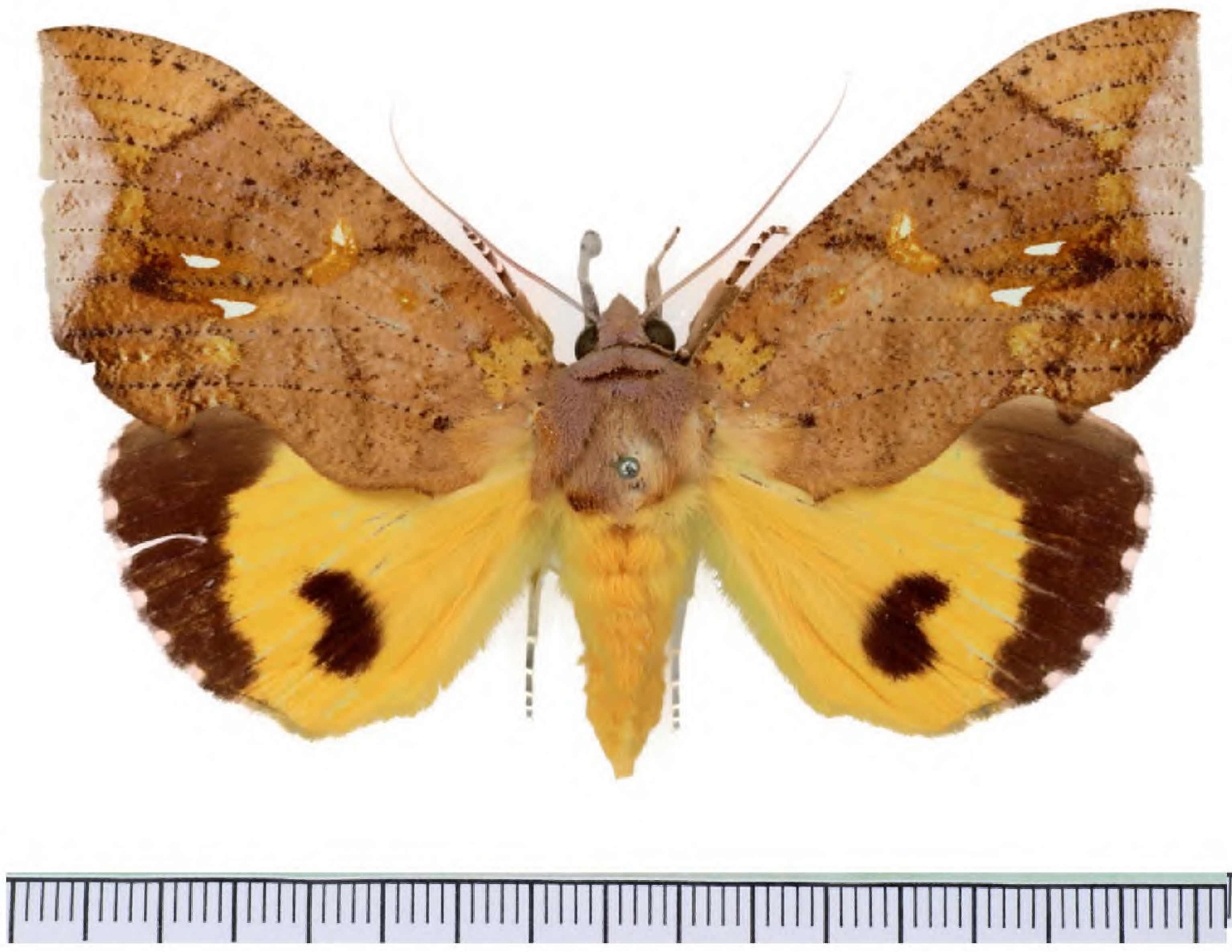

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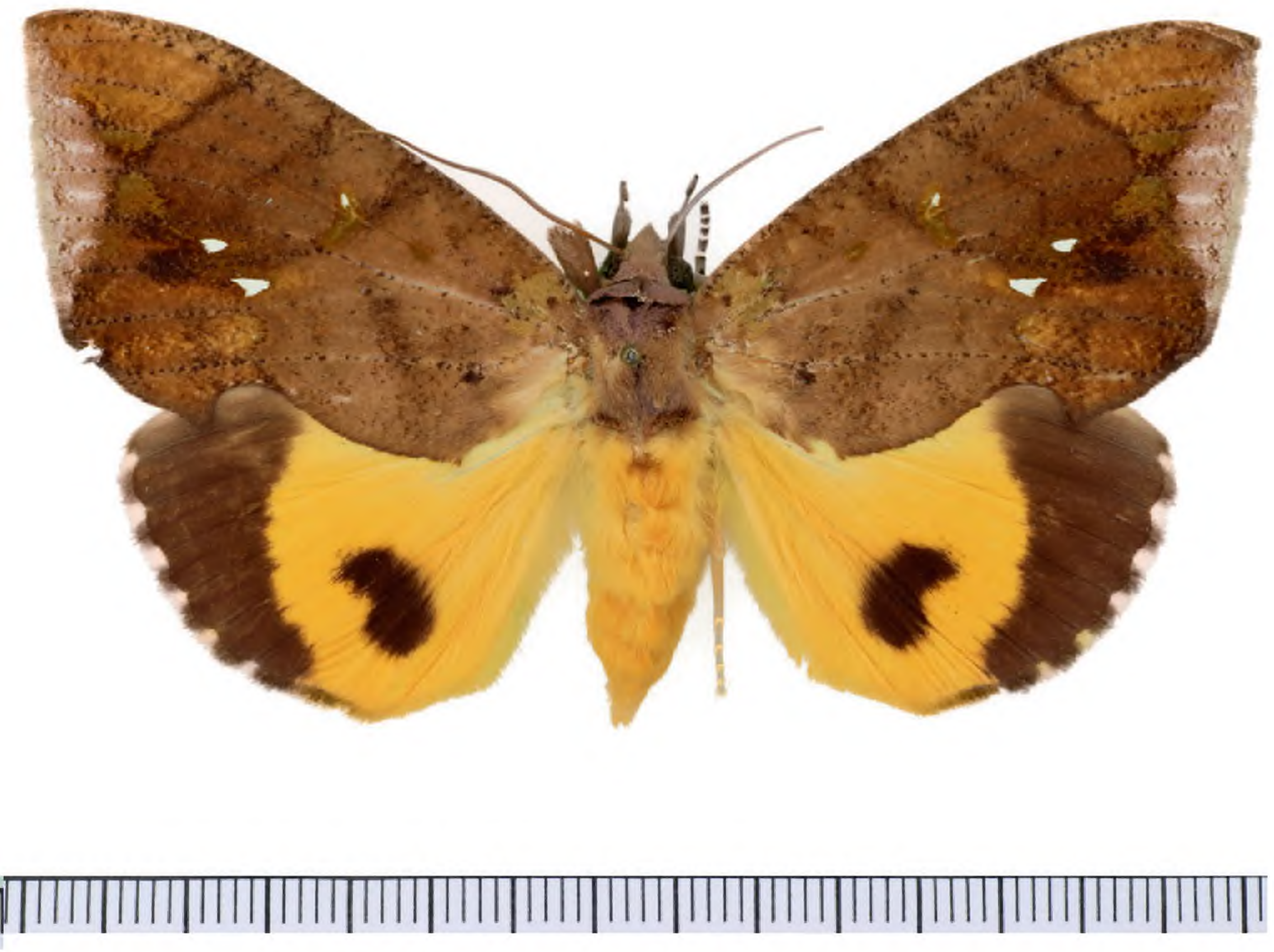

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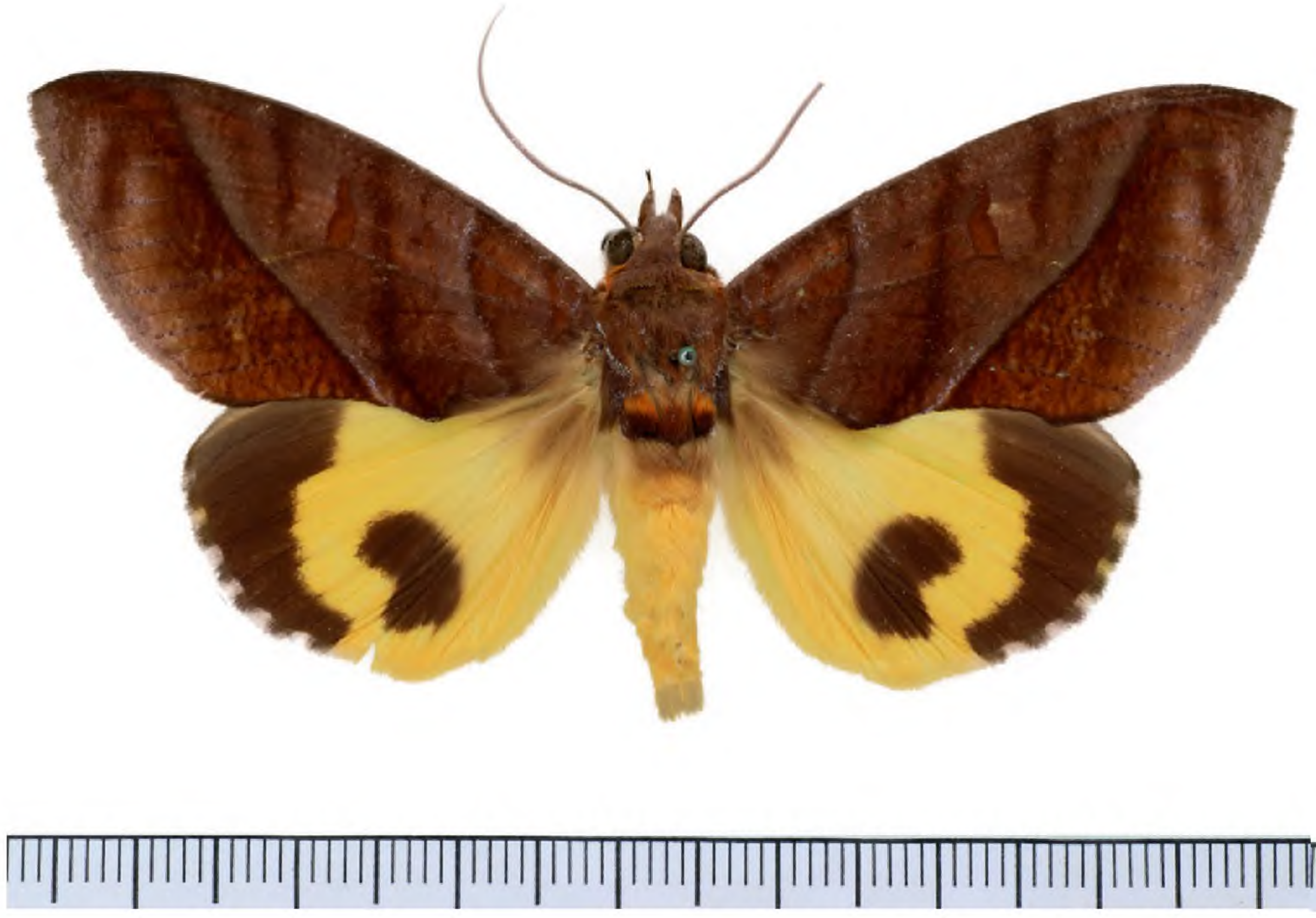

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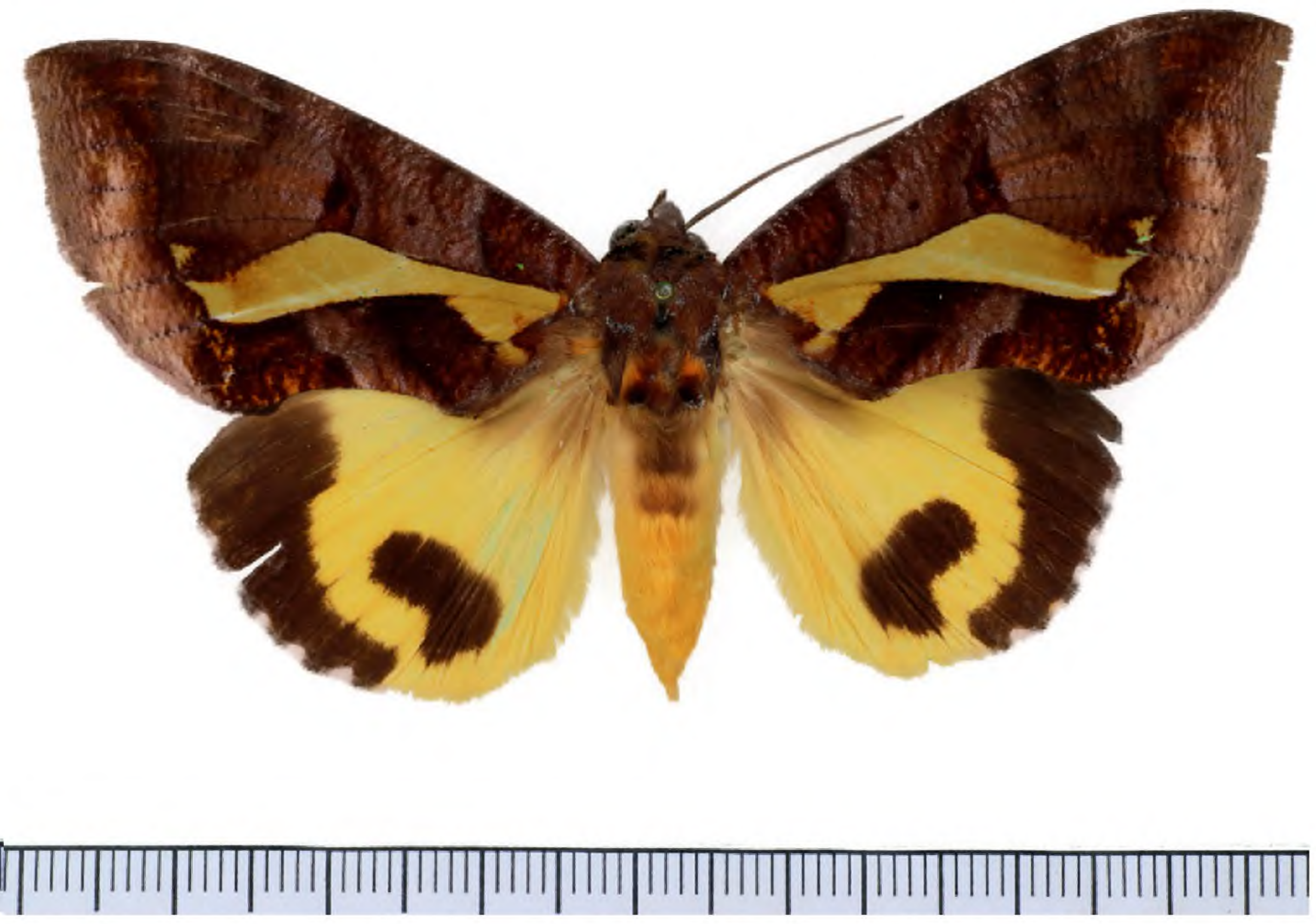

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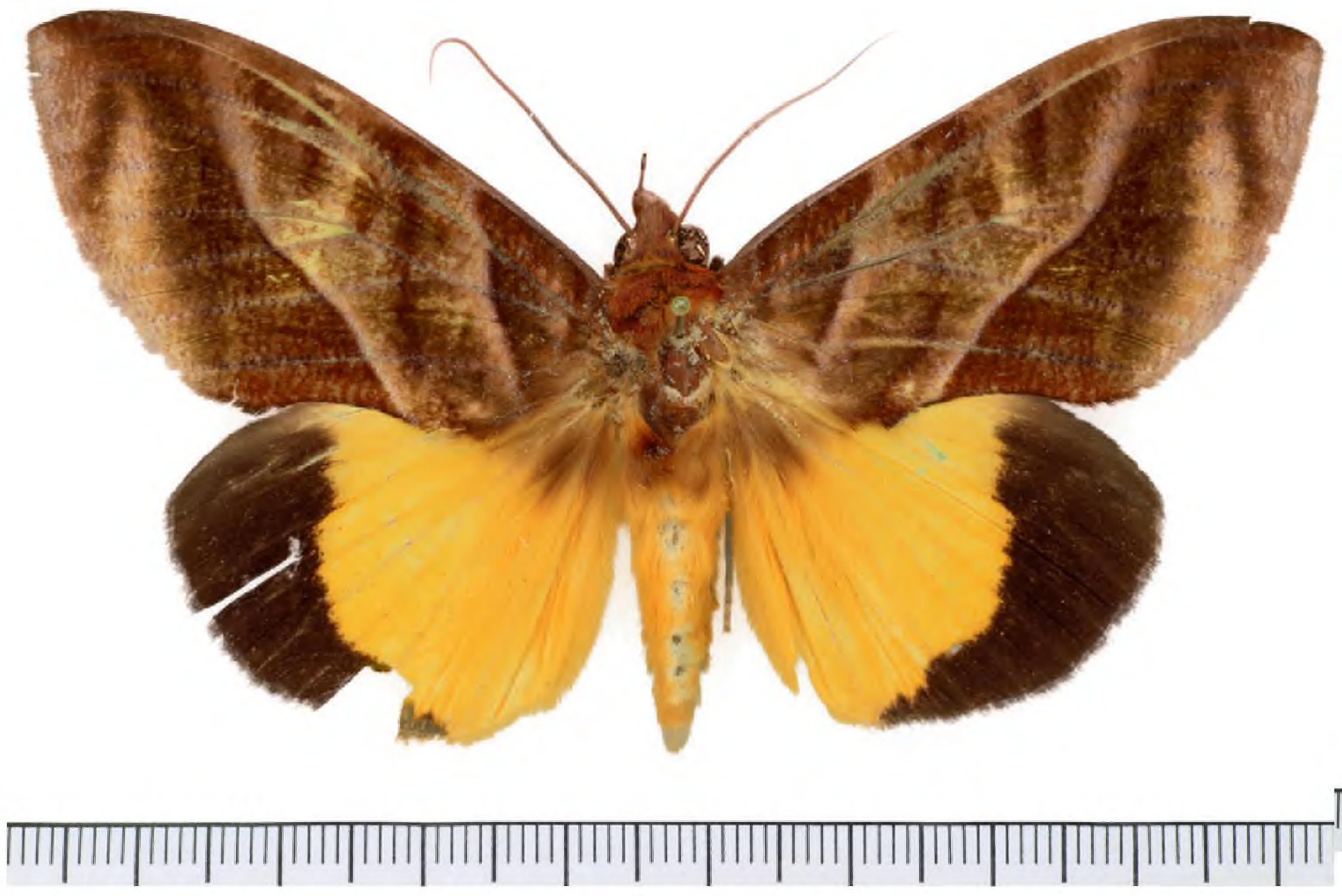
Figures 1-6. Habitus of *Eudocima* species. 1 – *E. muscigera* (Butler, 1882), ♂, New Guinea; 2 – ditto, ♂, New Guinea; 3 – ditto, ♀, New Guinea; 4 – ditto, ♀, New Guinea; 5 – *E. homaena* (Hübner, [1823]), ♂, Sulawesi; 6 – ditto, ♀, Sulawesi.

Plate 155



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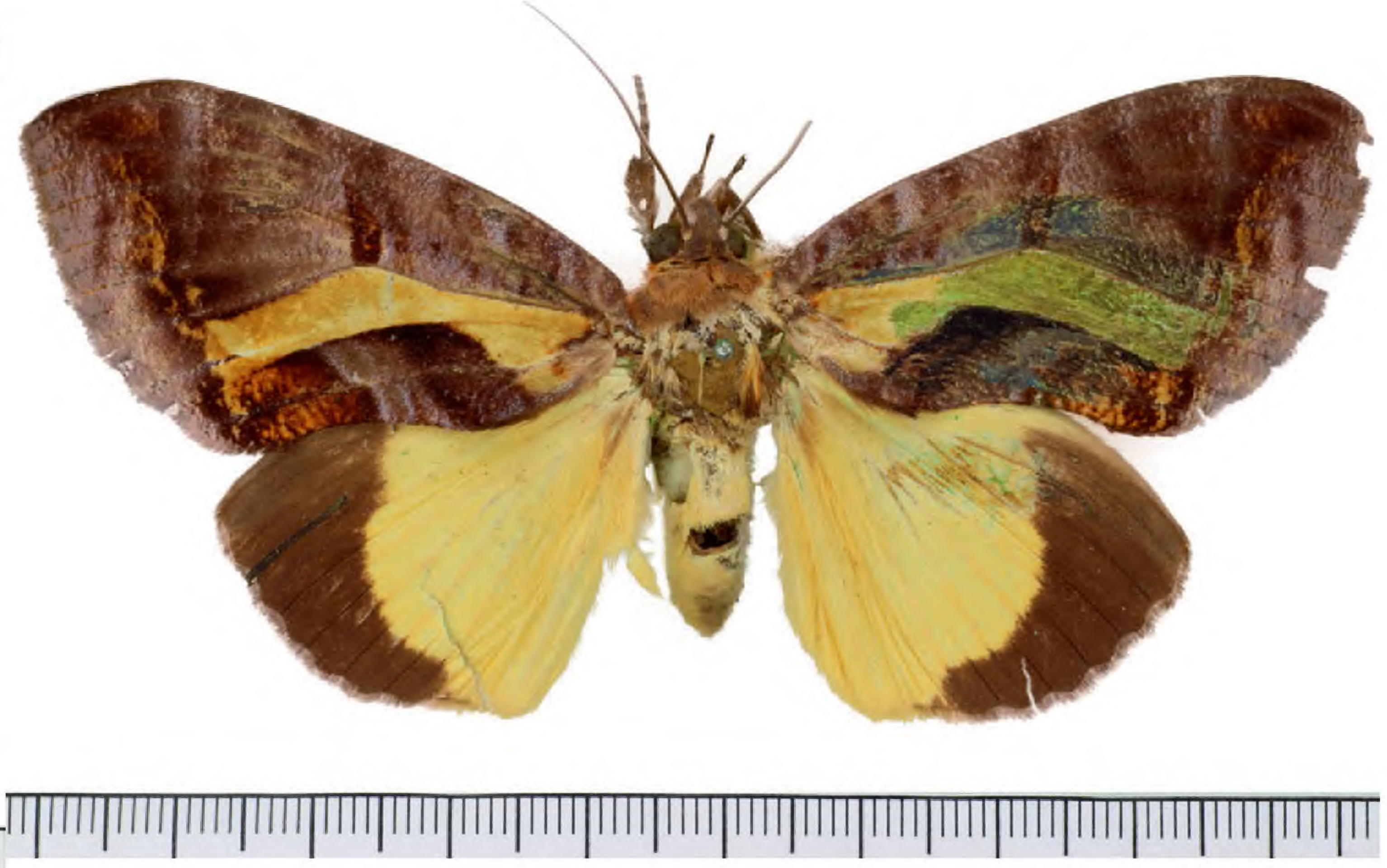

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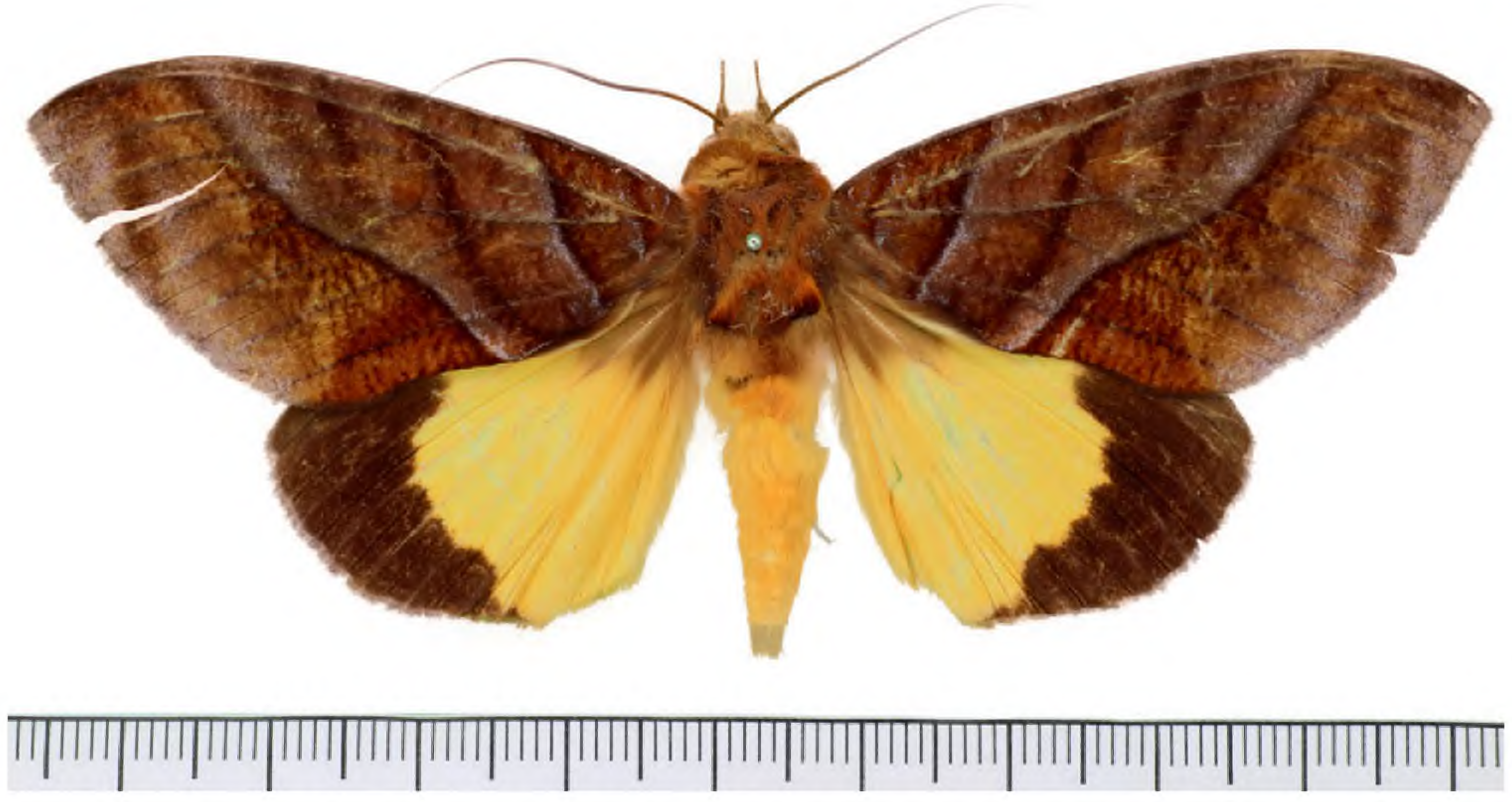

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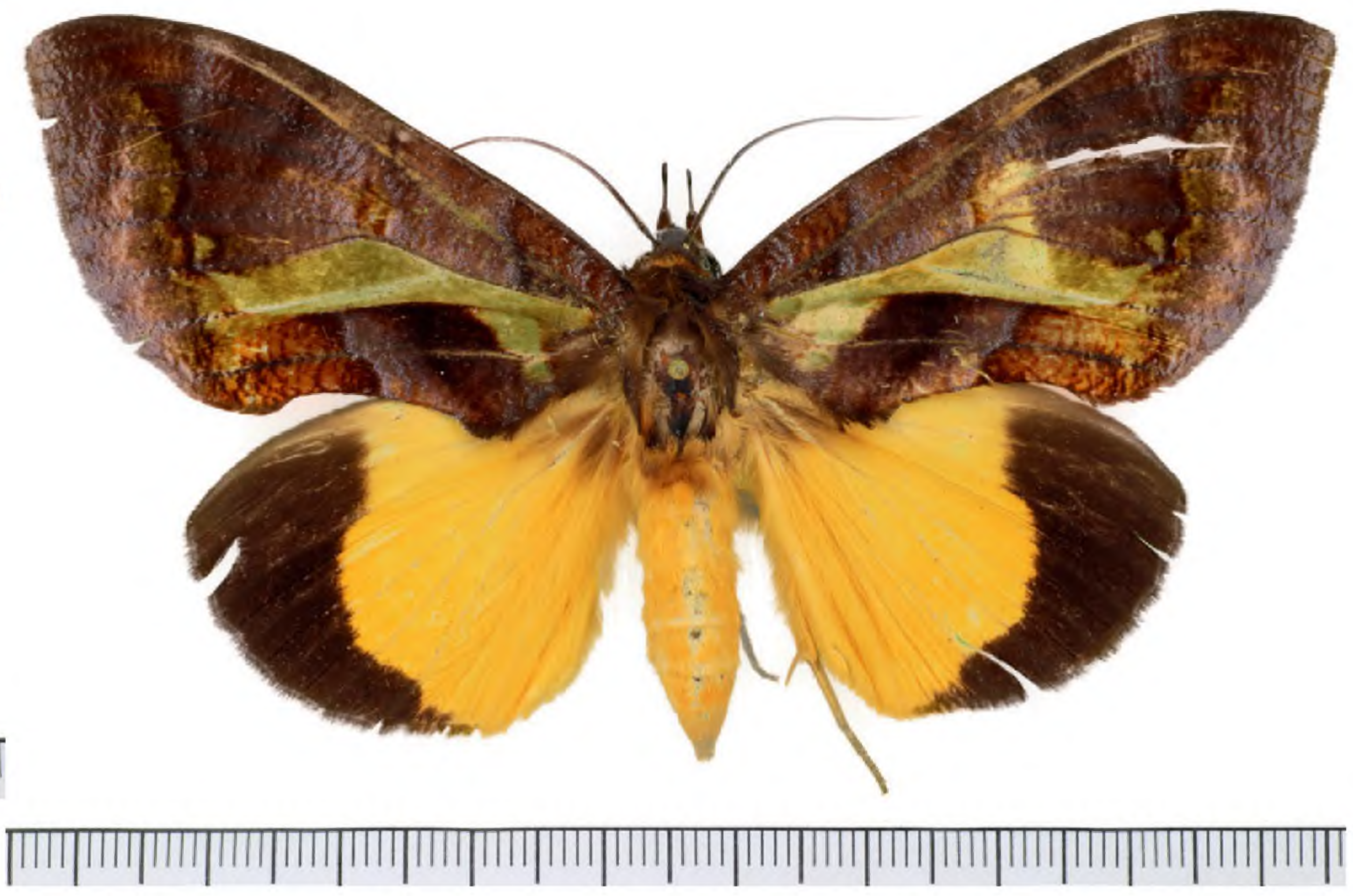

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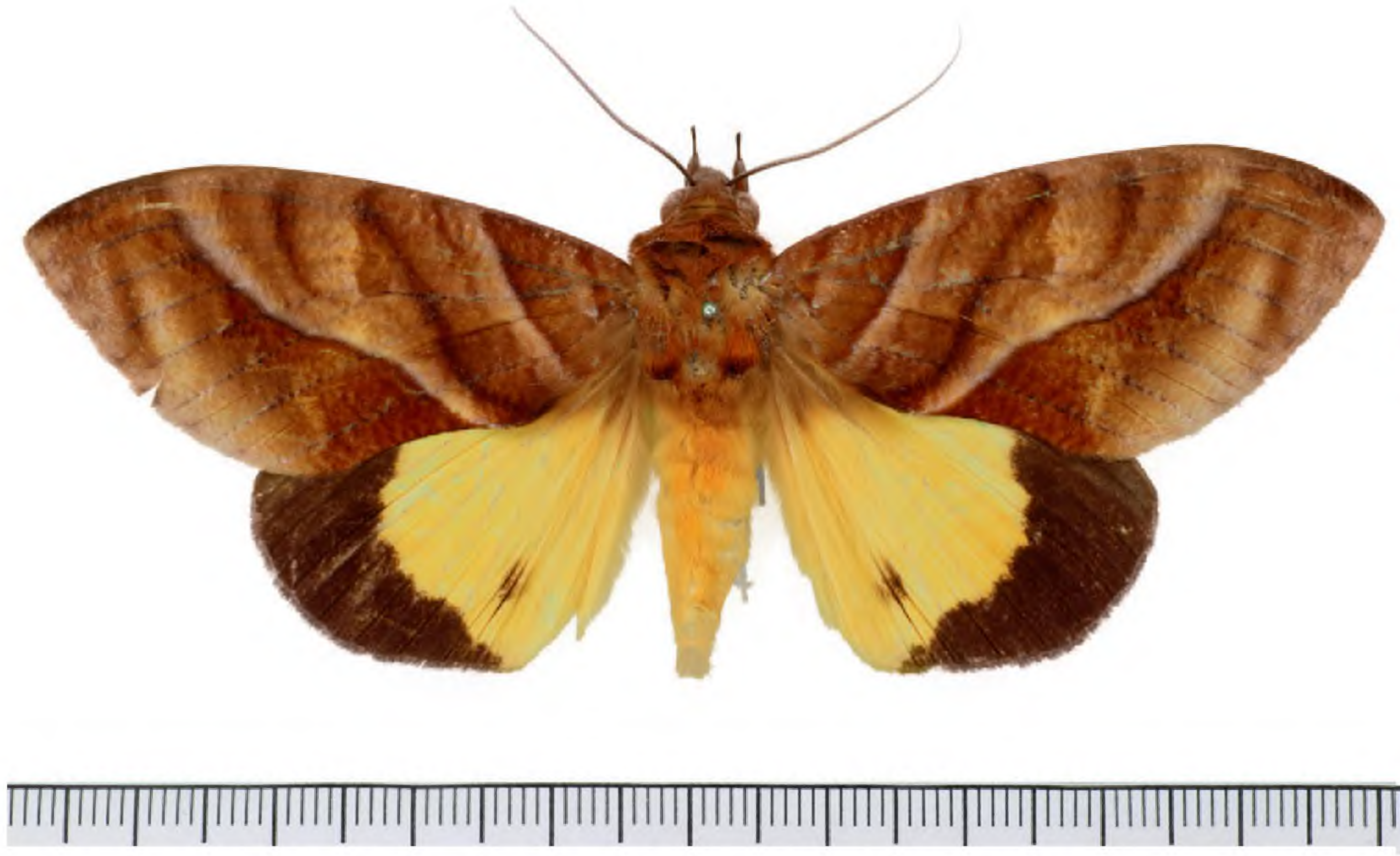

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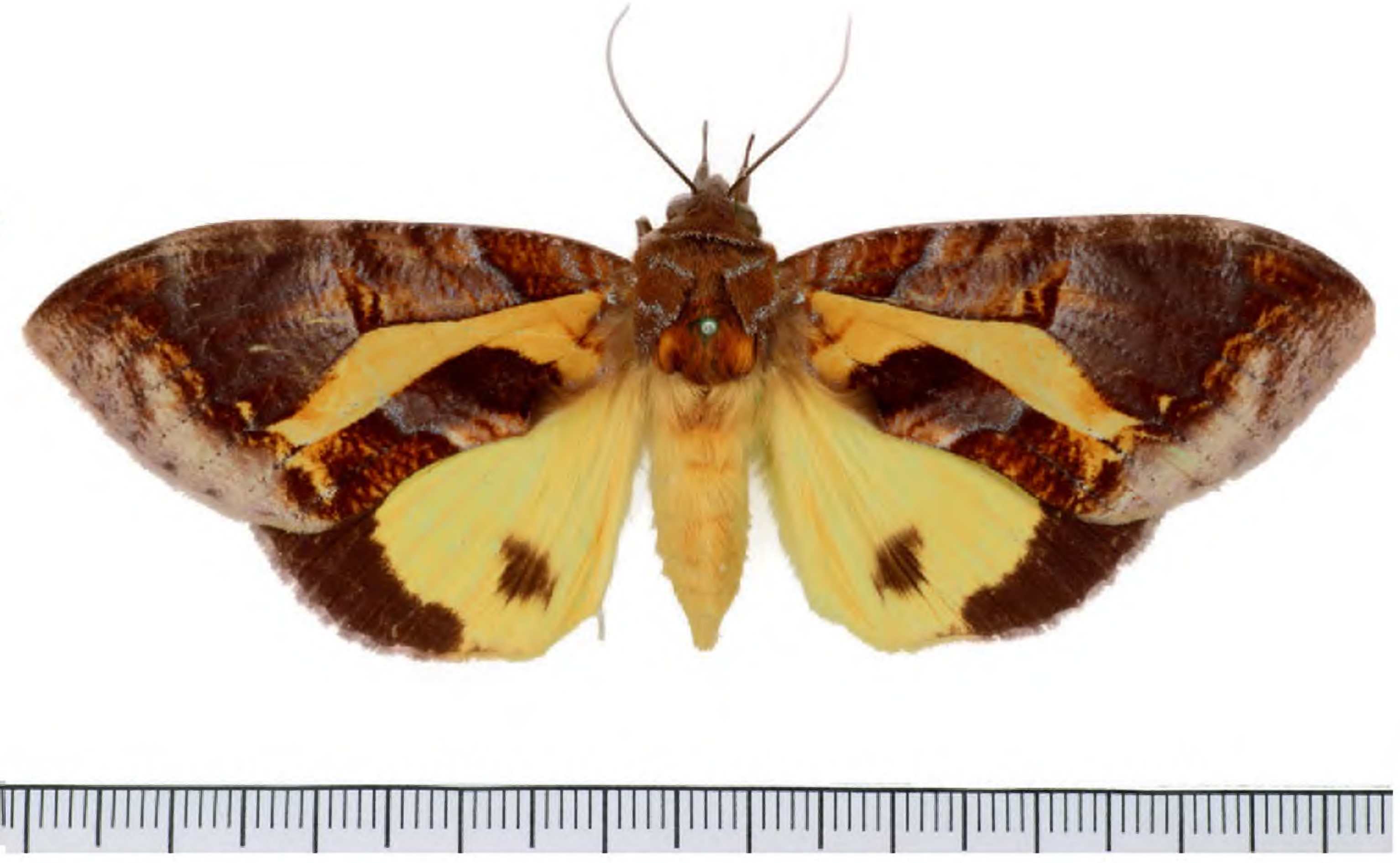

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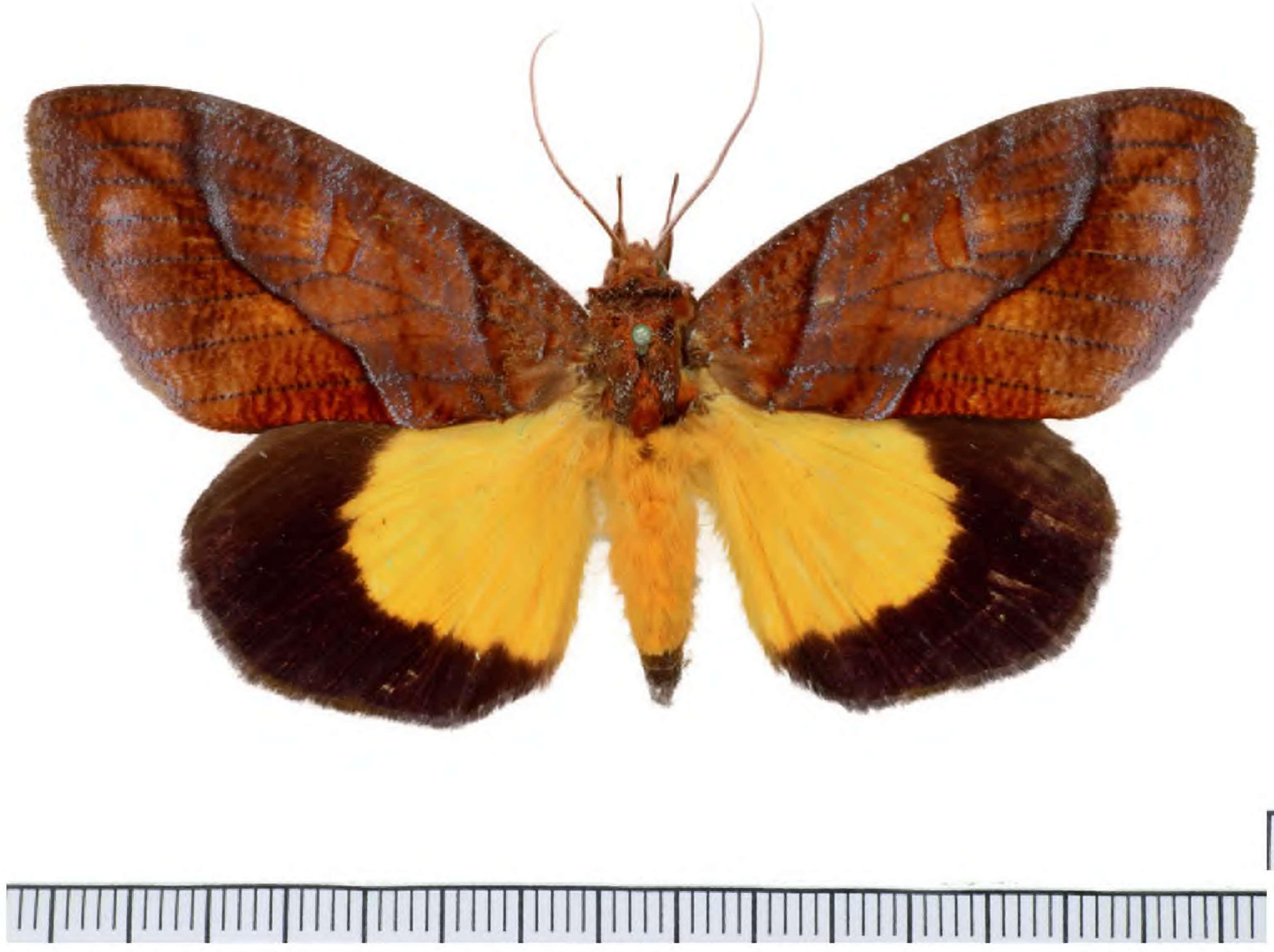
Figures 1-6. Habitus of *Eudocima caesar* (C. Felder, 1861). 1 – ♂, Seram; 2 – ditto, ♂ (syntype *Othreis prattorum* A.E. Prout, 1922), Seram; 3 – ditto, ♂ (syntype *O. prattorum*), Seram; 4 – ditto, syntype ♀, Ambon; 5 – ditto, ♀, Seram; 6 – ditto, ♀ (syntype *E. prattorum*), Seram.



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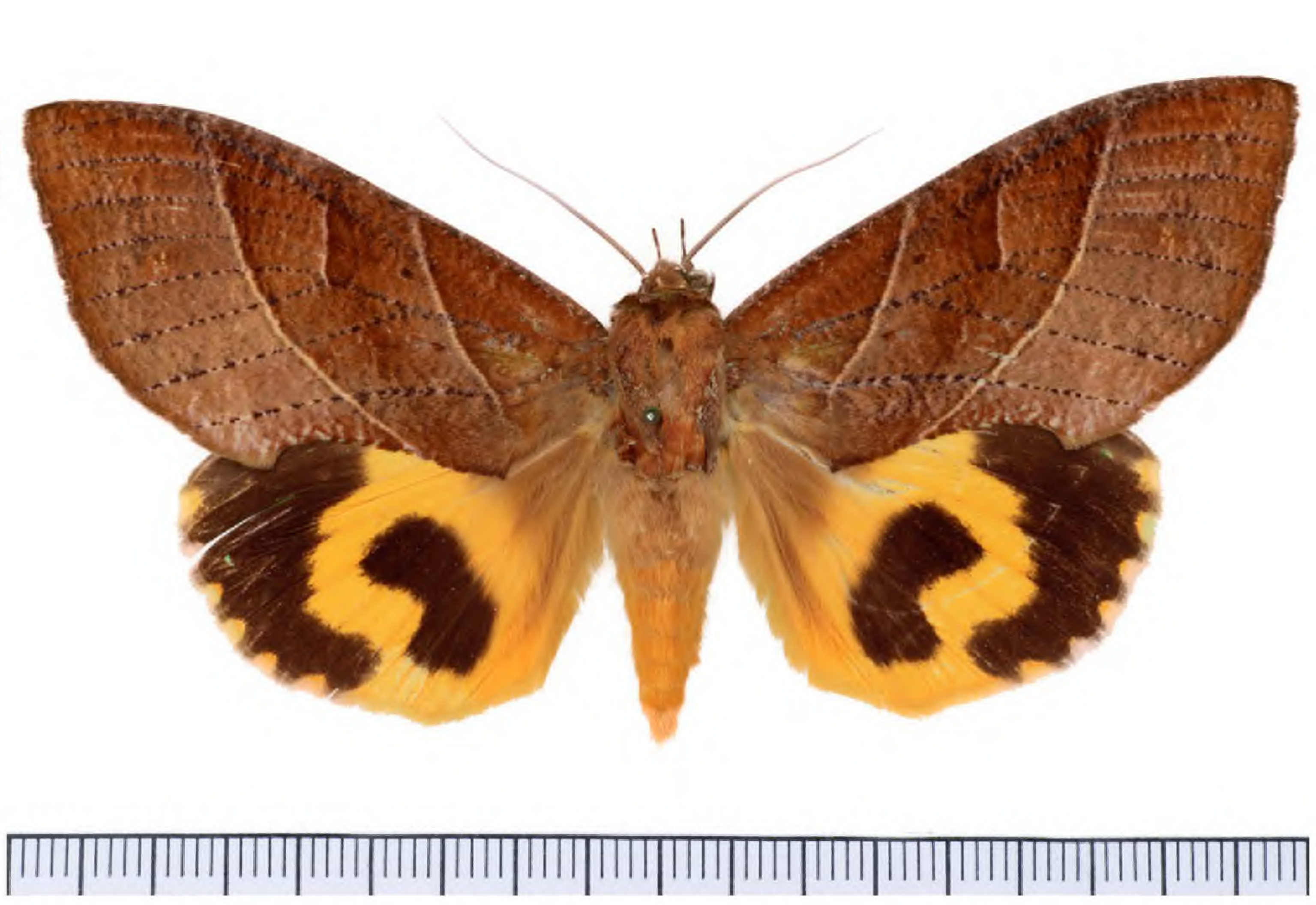

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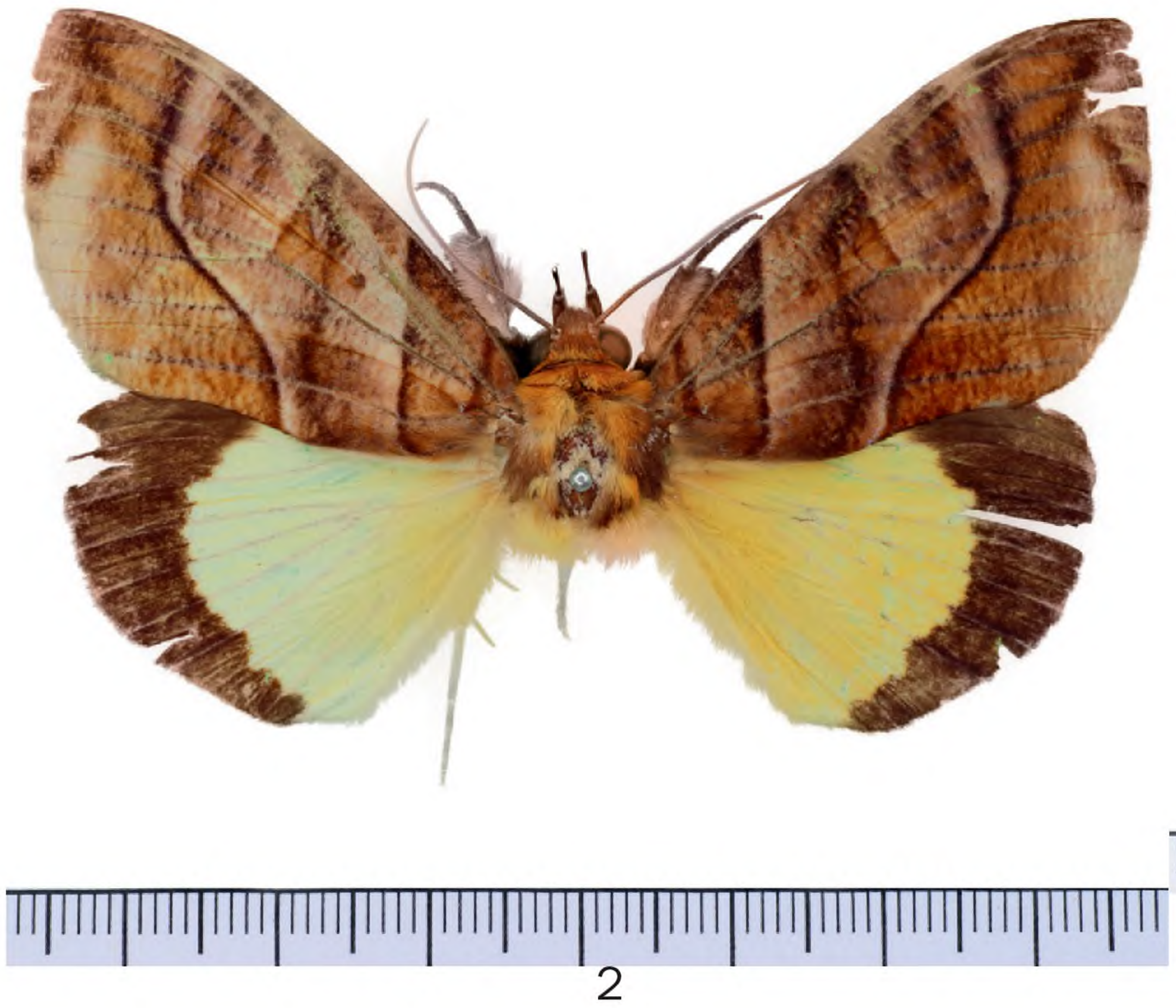

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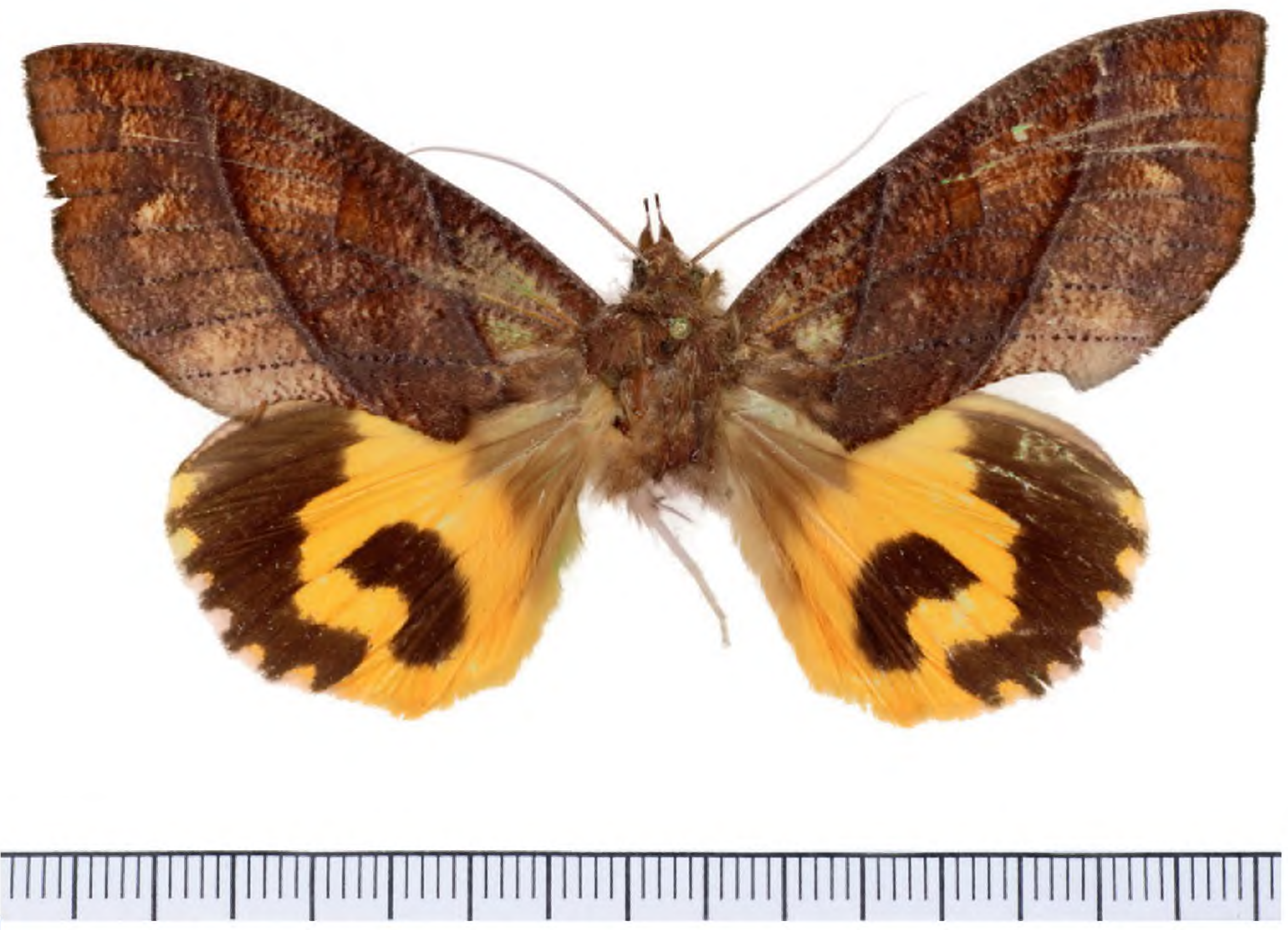

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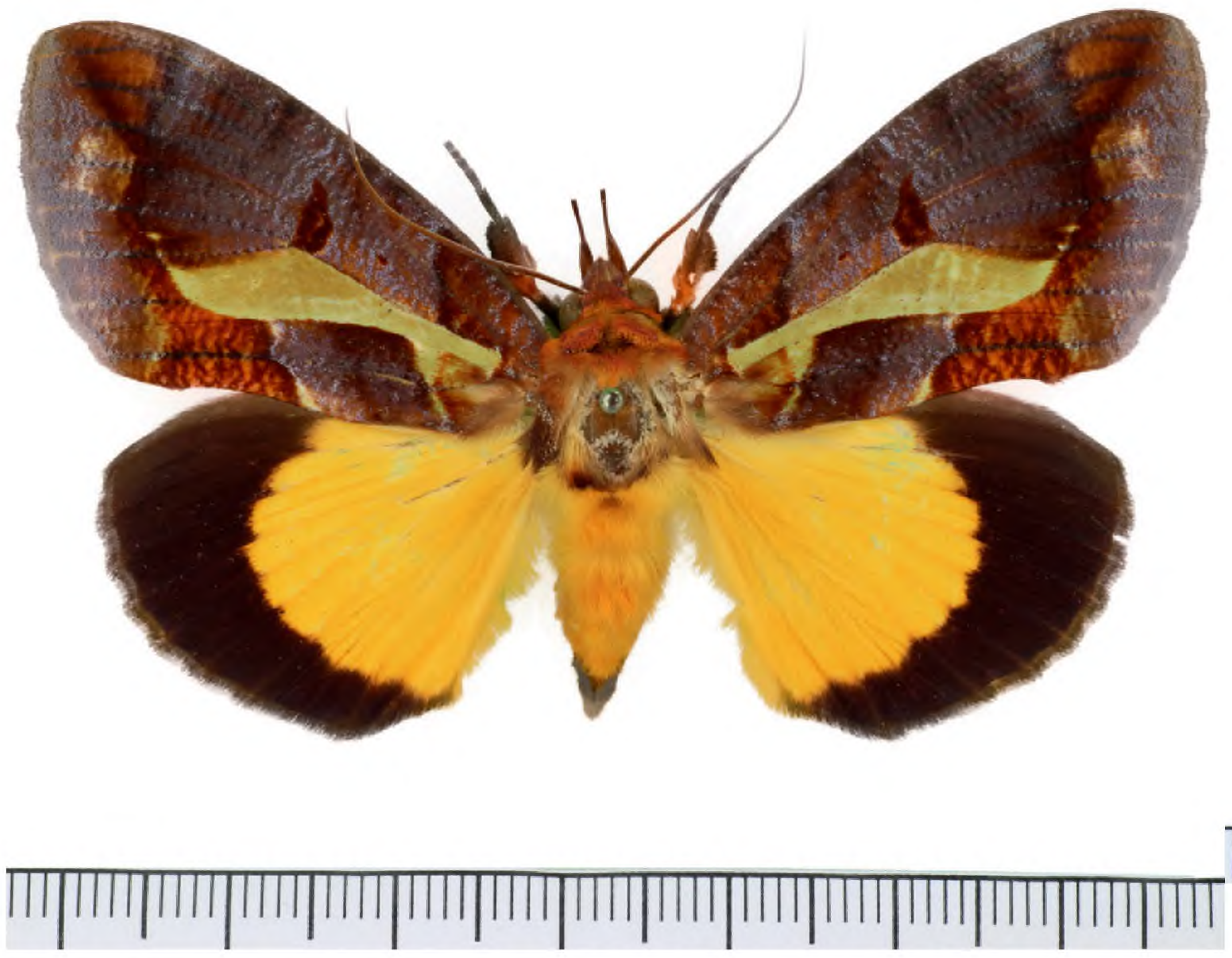

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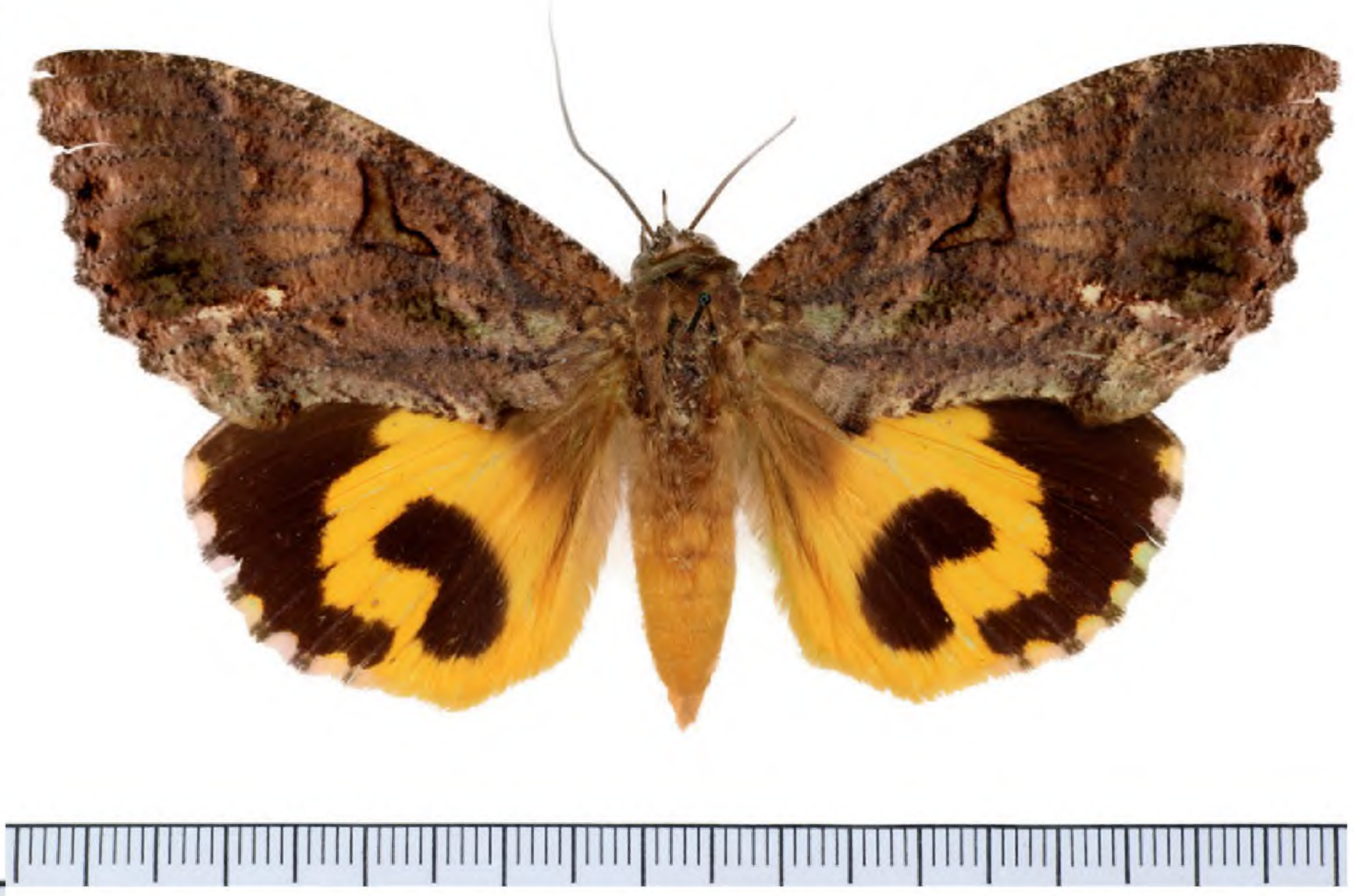

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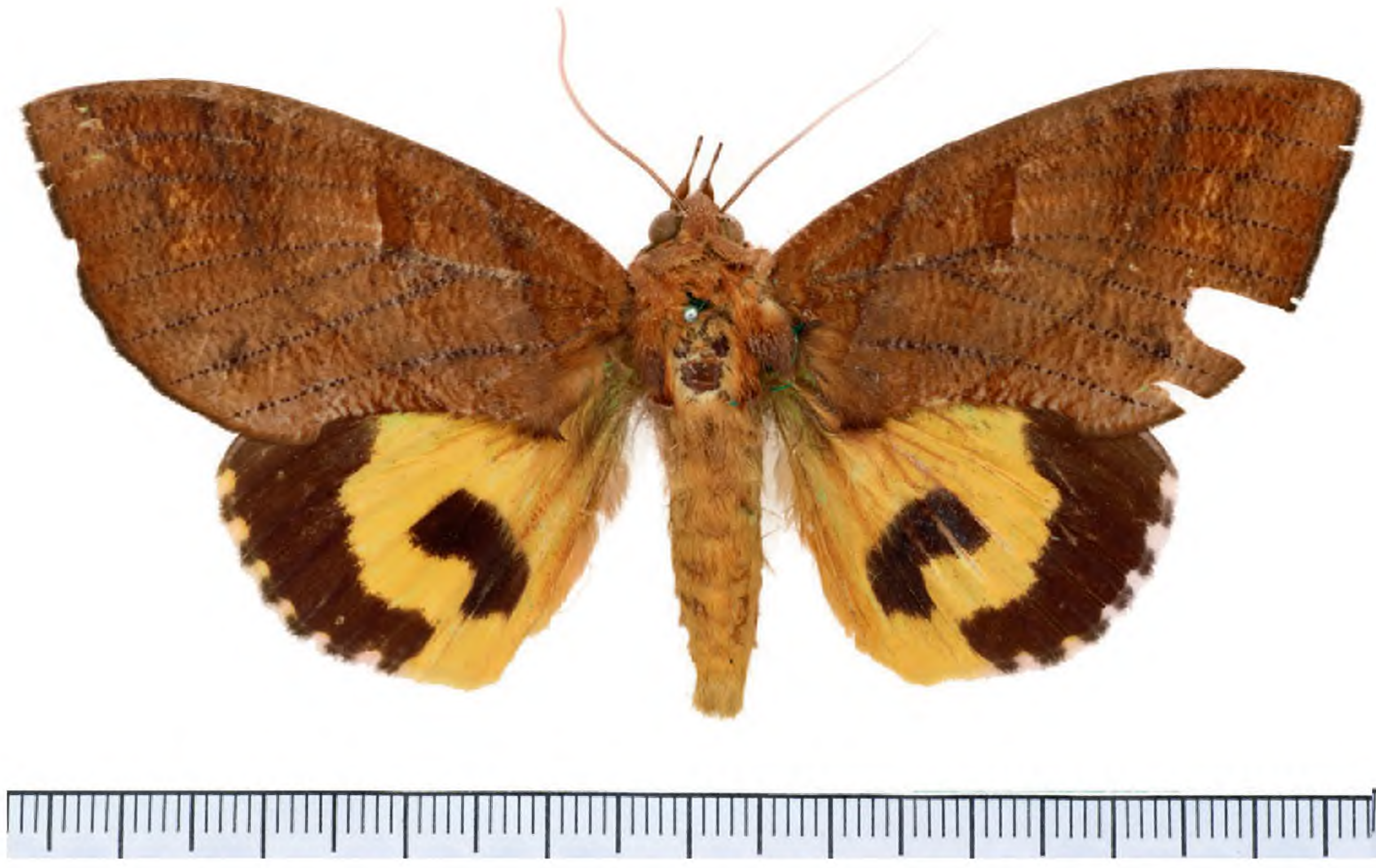
Figures 1-6. Habitus of *Eudocima* species. 1 – *E. iridescens* (T.P. Lucas, 1894), ♂, New Guinea; 2 – ditto, ♂, New Britain; 3 – ditto, ♀, Rossell I.; 4 – *E. srivijayana* (Bänziger, 1985), ♂, Philippines (Mindanao I.); 5 – ditto, ♂, Sulawesi; 6 – ditto, ♀, Timor I.

Plate 157

Zilli, A., Brou, V.A., Klem C., Zaspel, J.: The *Eudocima* Billberg, 1820 of the Australian Region (Lepidoptera) ...



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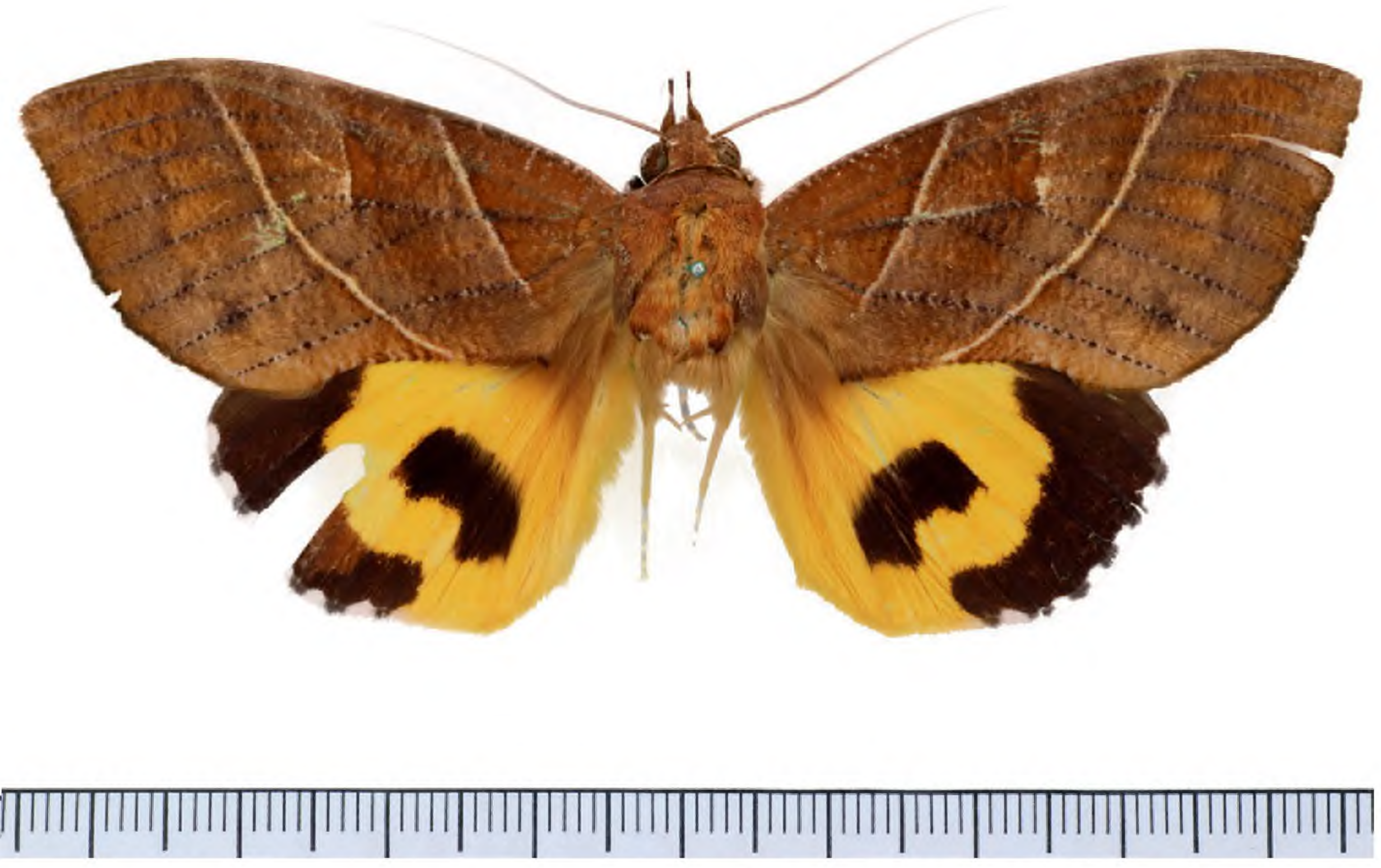

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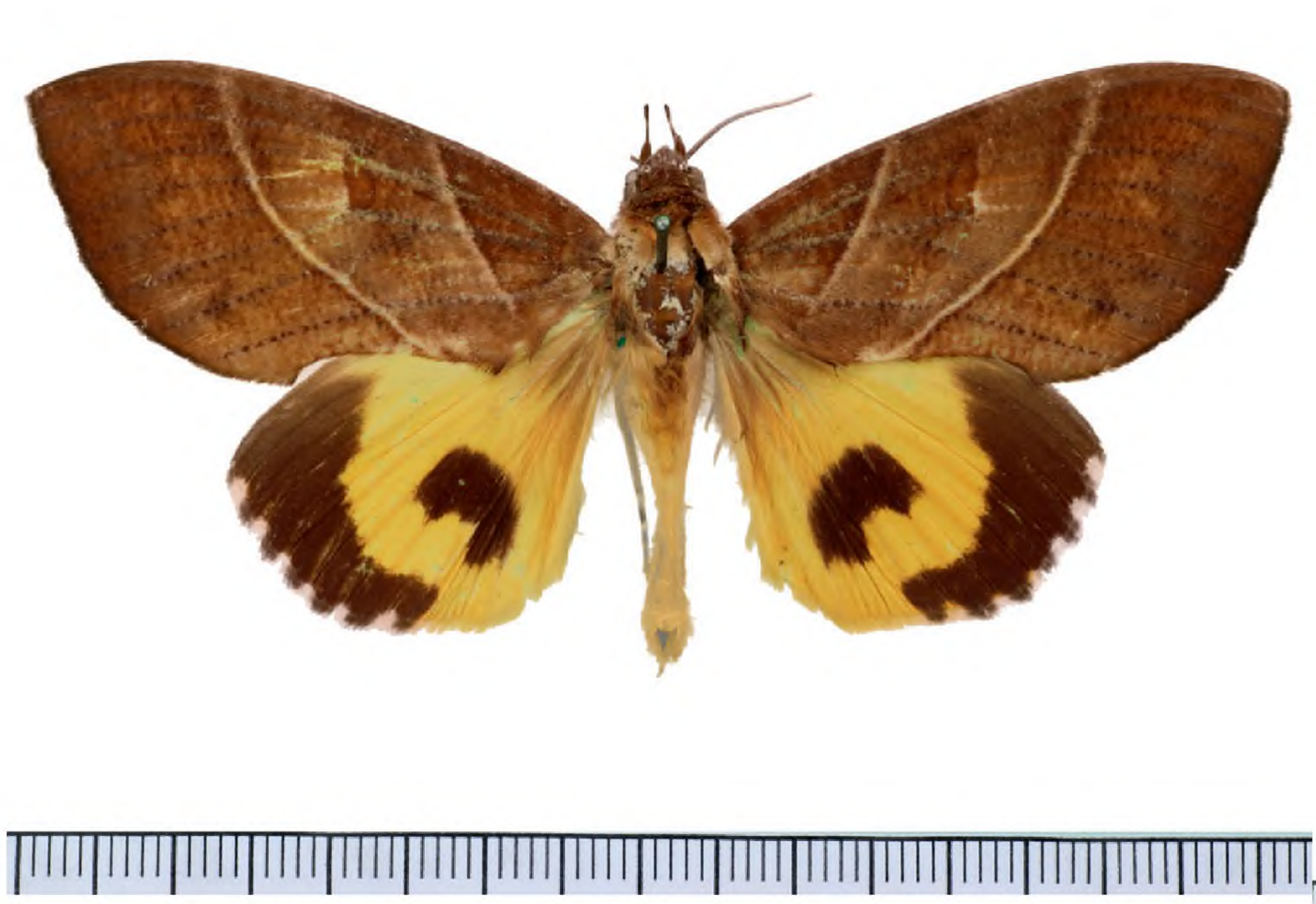

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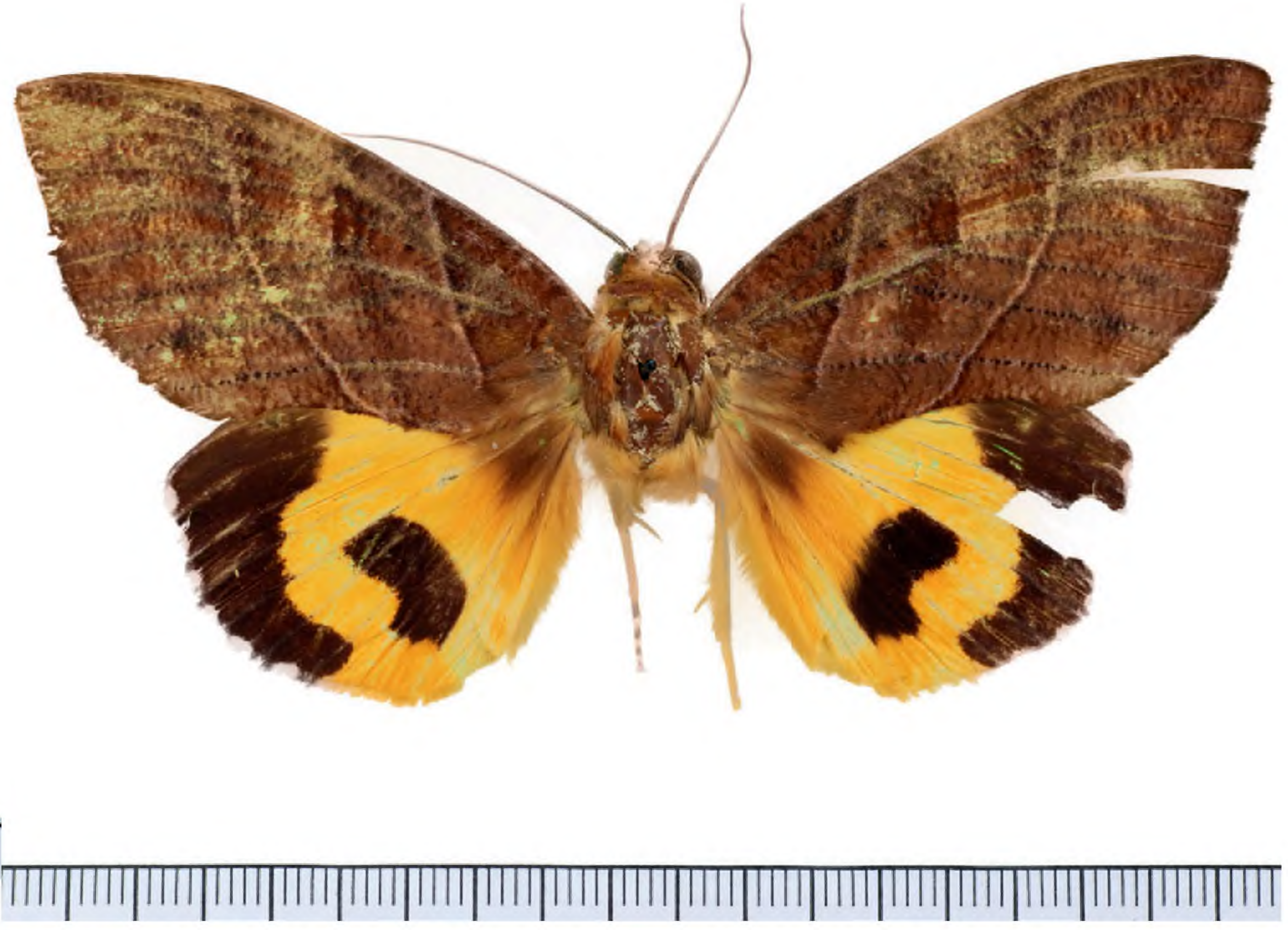

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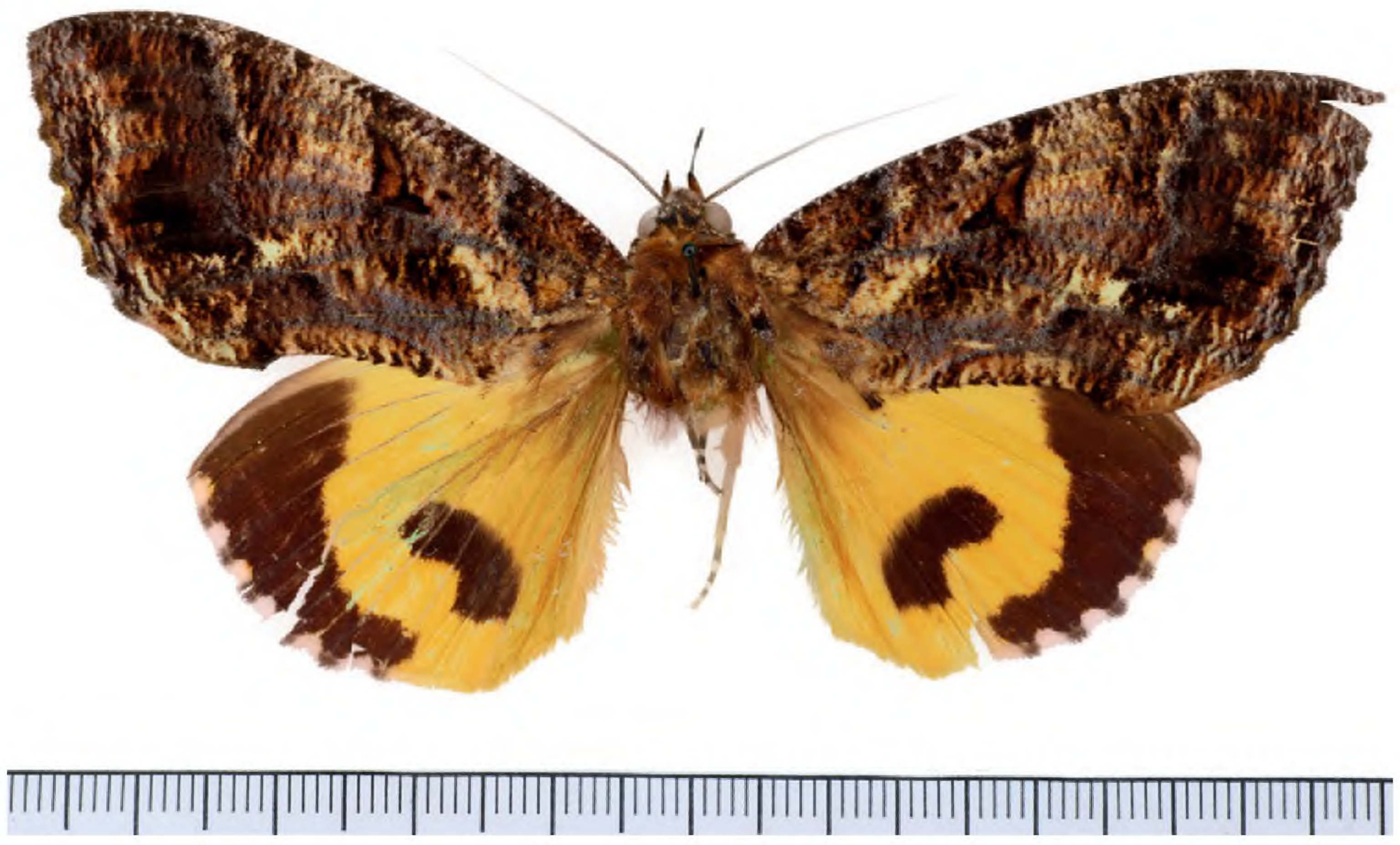

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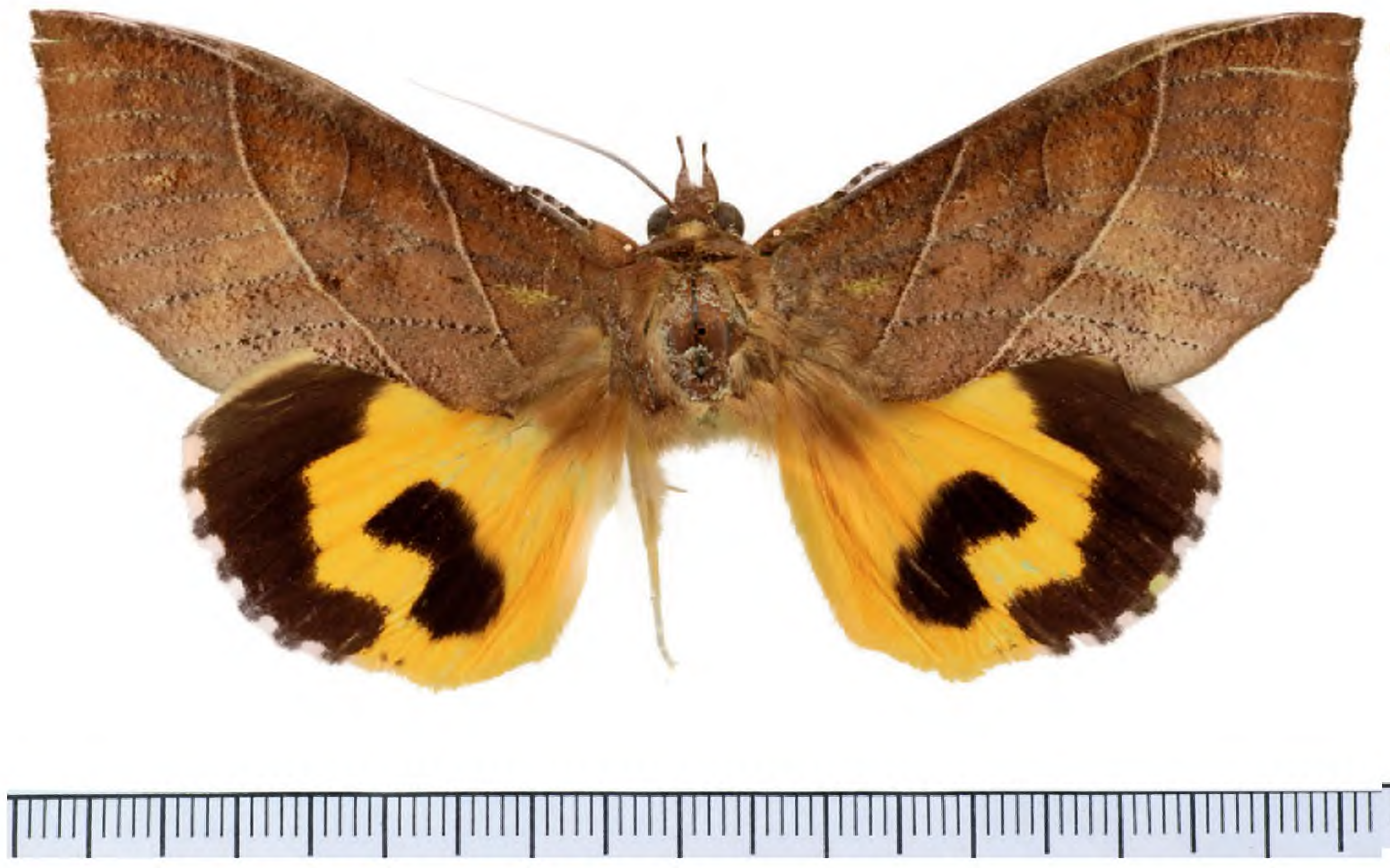
Figures 1-5. Habitus of *Eudocima talboti* (A.E. Prout, 1922). 1 – Syntype ♂, Seram; 2 – ditto, syntype ♂, Seram; 3 – ditto, ♂, Ambon; 4 – ditto, ♂, Mefor I.; 5 – ditto, ♀, Halmahera.

Plate 158



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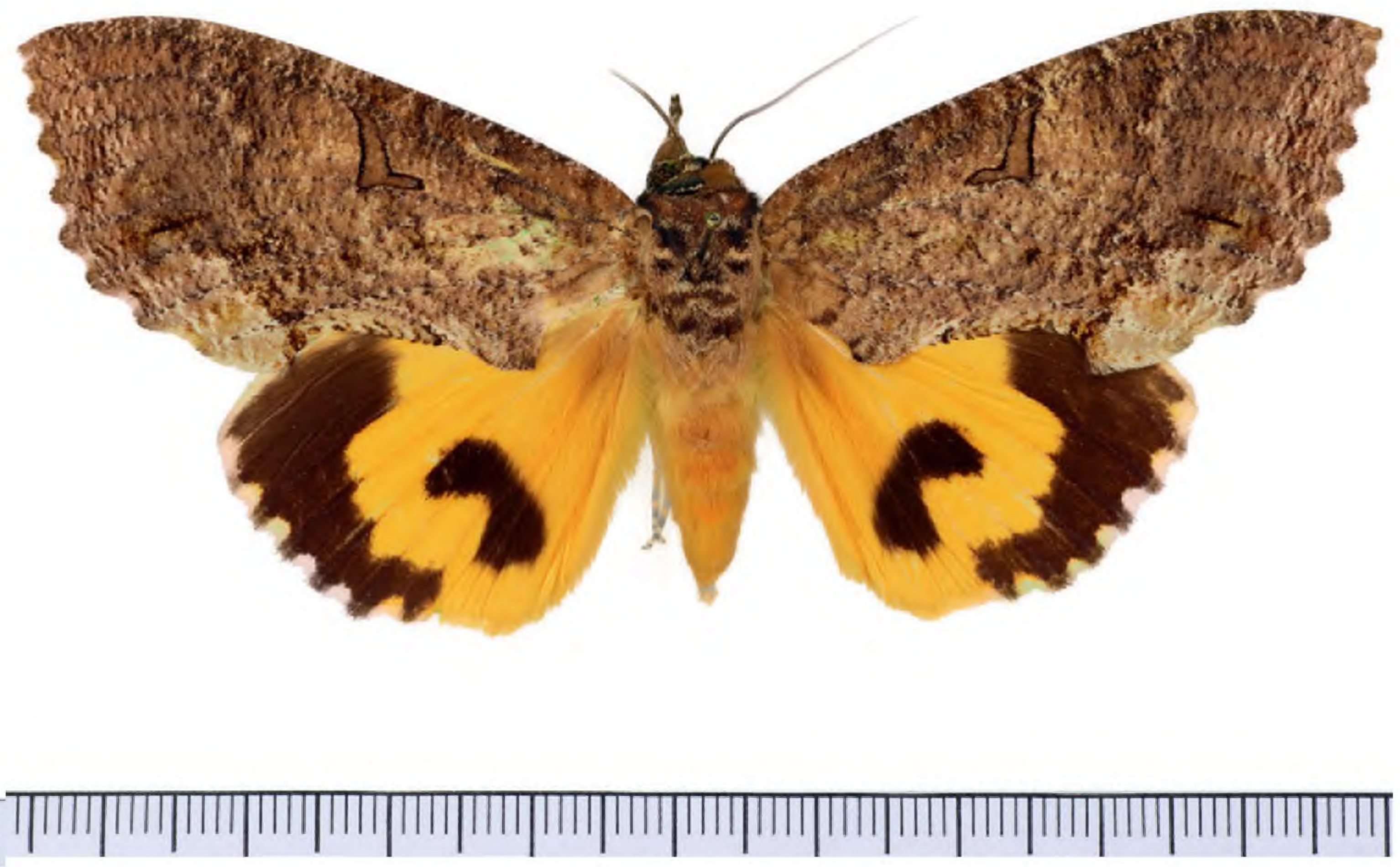

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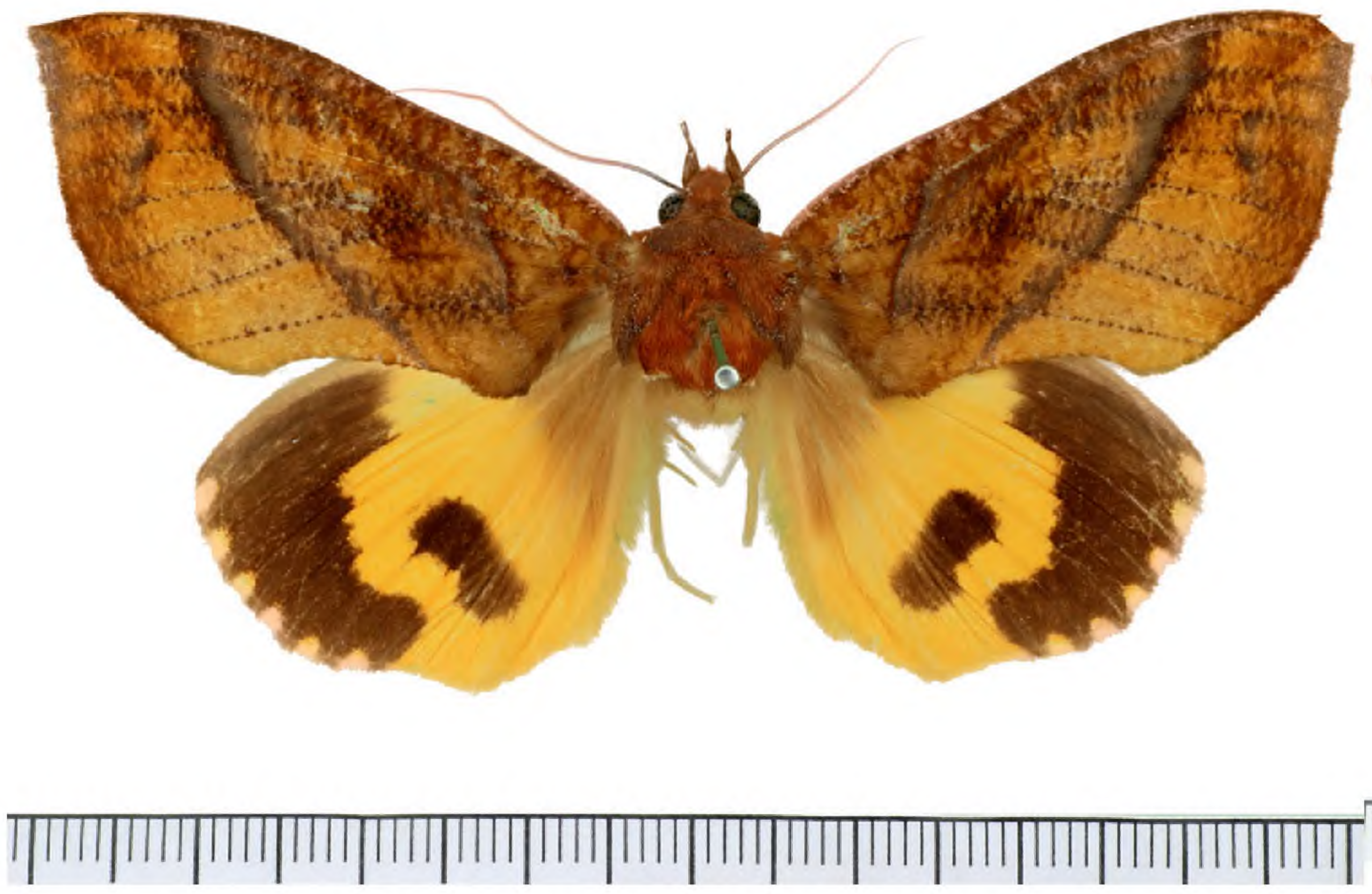

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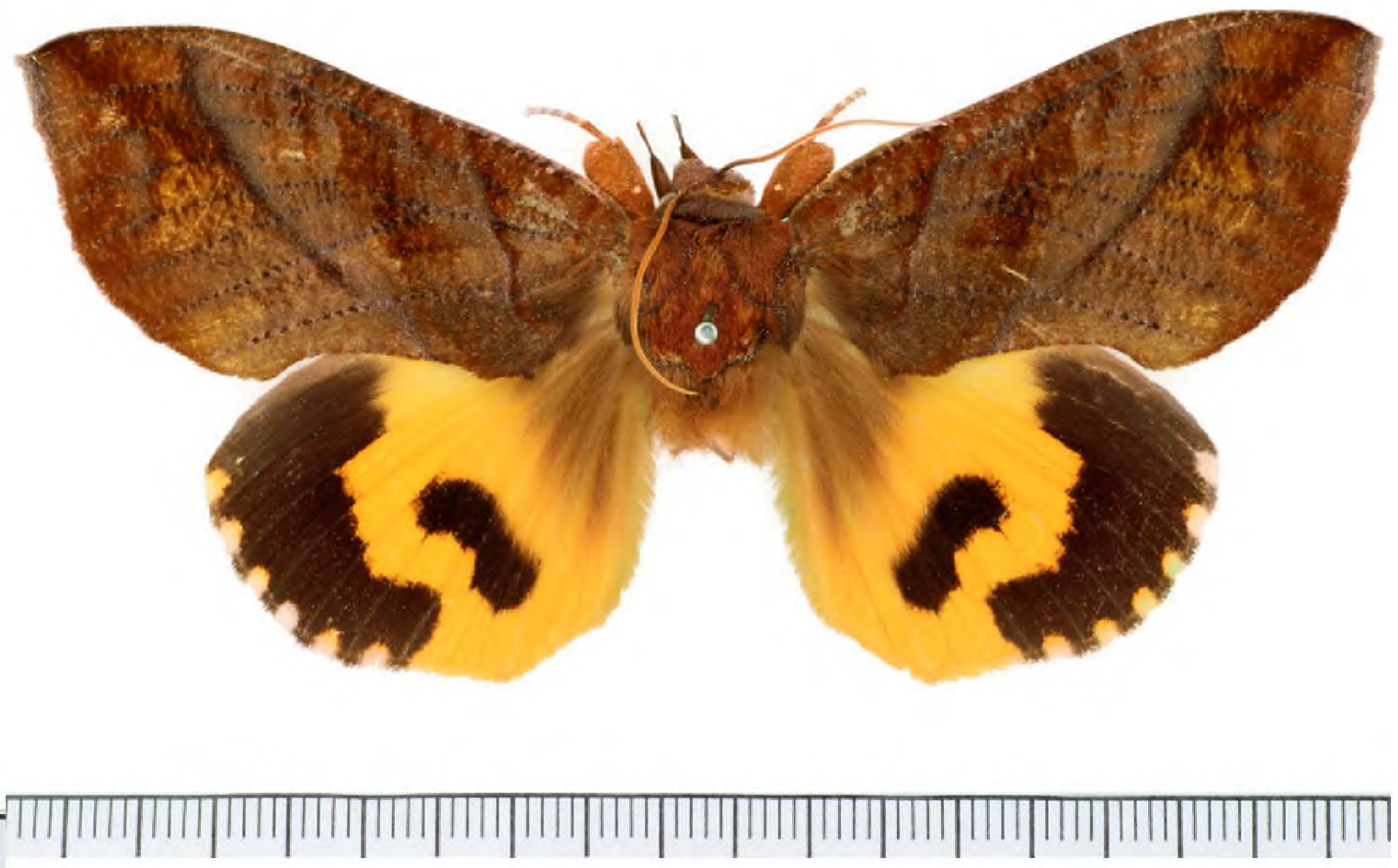

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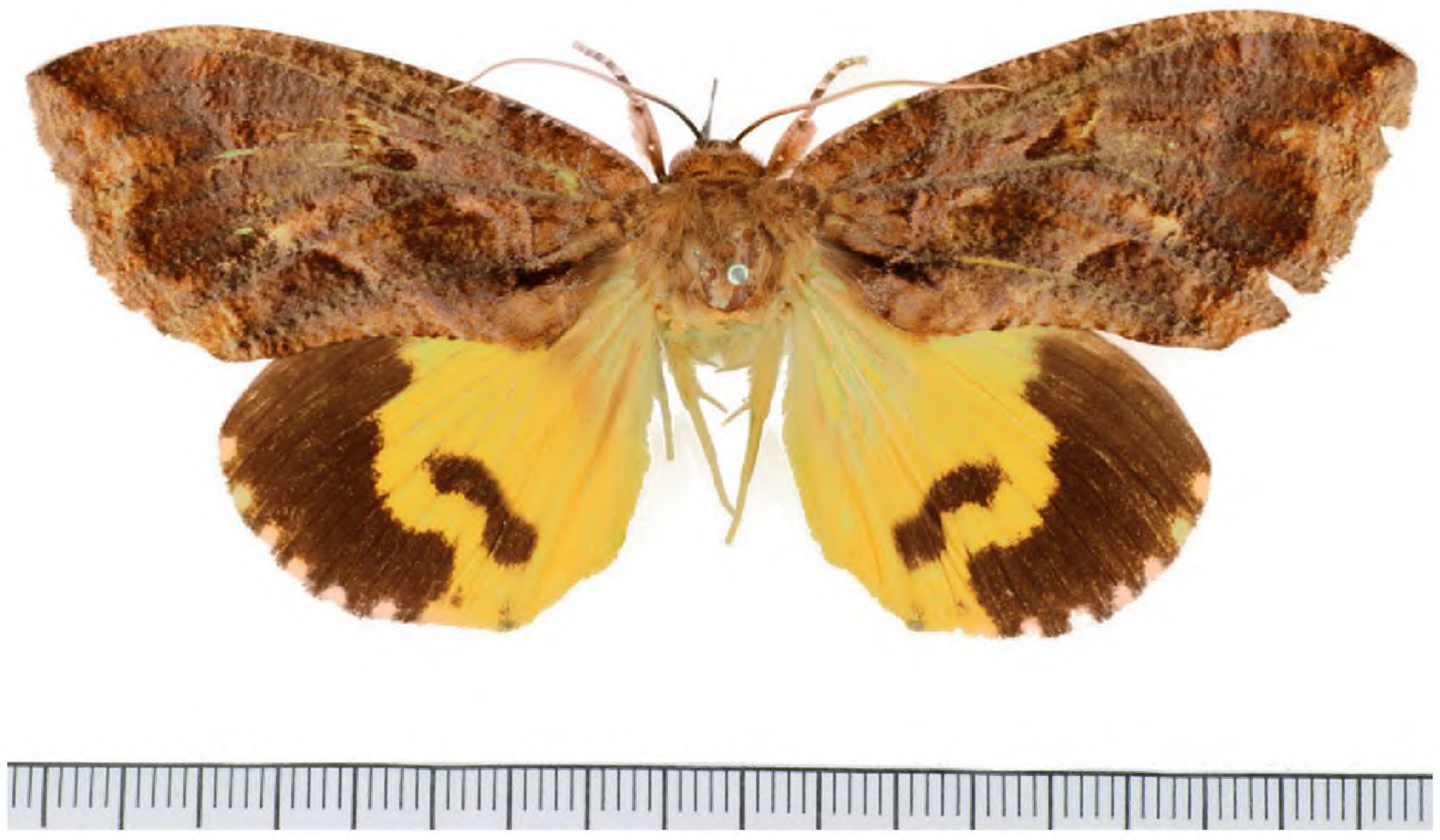

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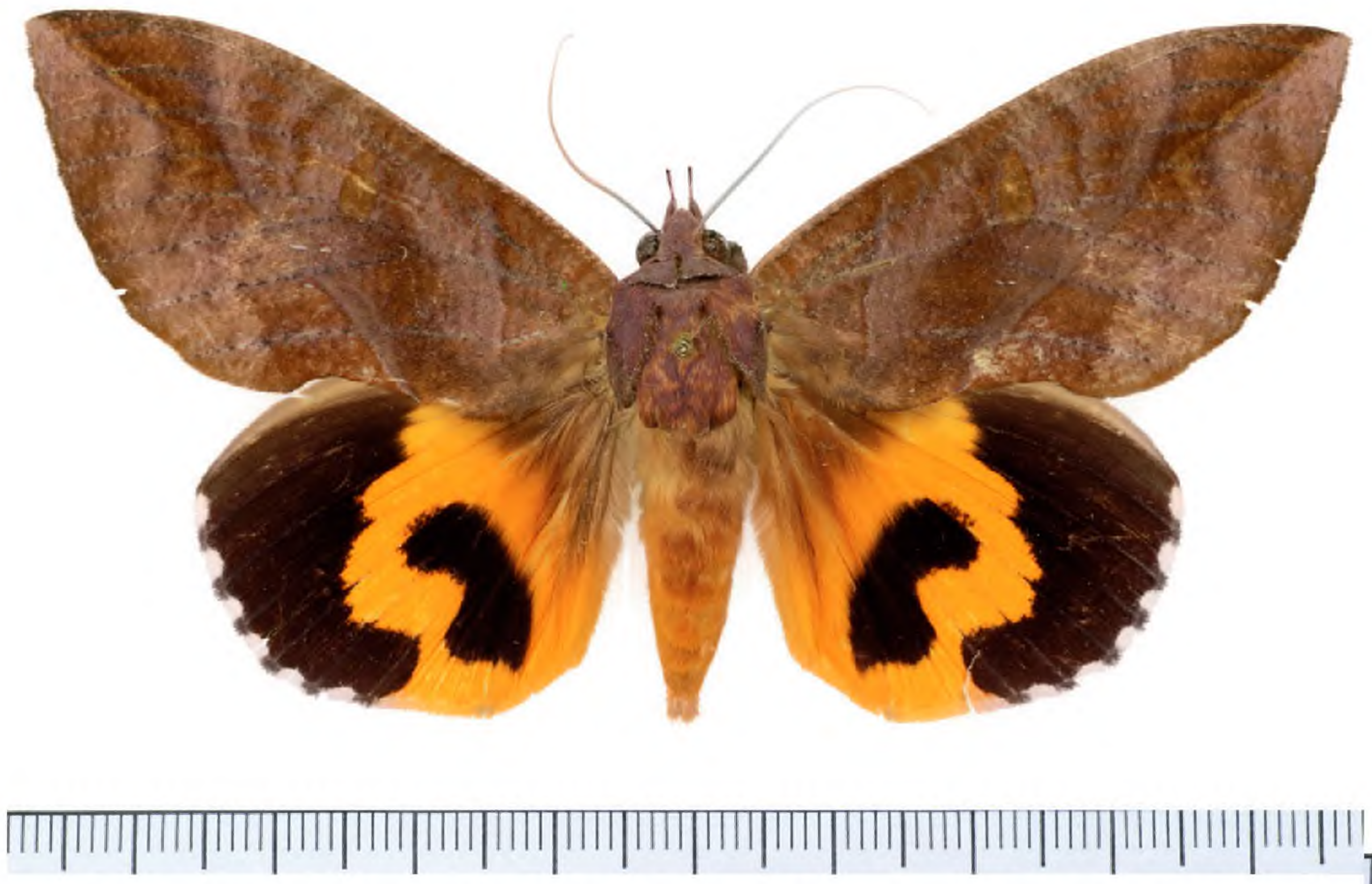
Figures 1-5. Habitus of *Eudocima* species. 1 – *E. cajeta* (Cramer, [1775]), ♂, Vietnam; 2 – ditto, ♀, Myanmar; 3 – *E. oliveri* sp. nov., holotype ♂, Vanuatu (Aneityum); 4 – ditto, paratype ♂, Vanuatu (Aneityum); 5 – ditto, paratype ♀, Vanuatu (Espiritu Santo).

Plate 159

Zilli, A., Brou, V.A., Klem C., Zaspel, J.: The *Eudocima* Billberg, 1820 of the Australian Region (Lepidoptera) ...



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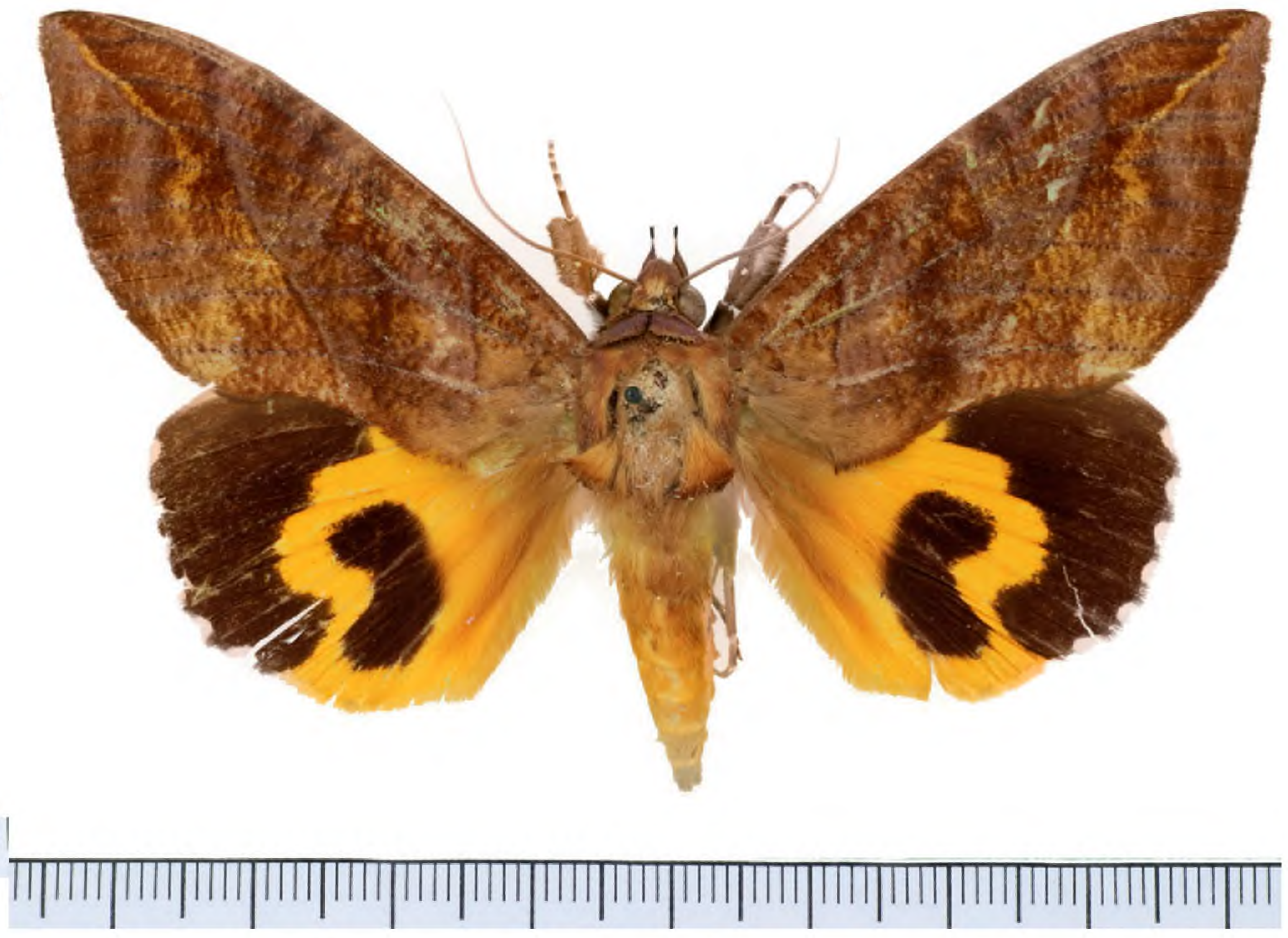

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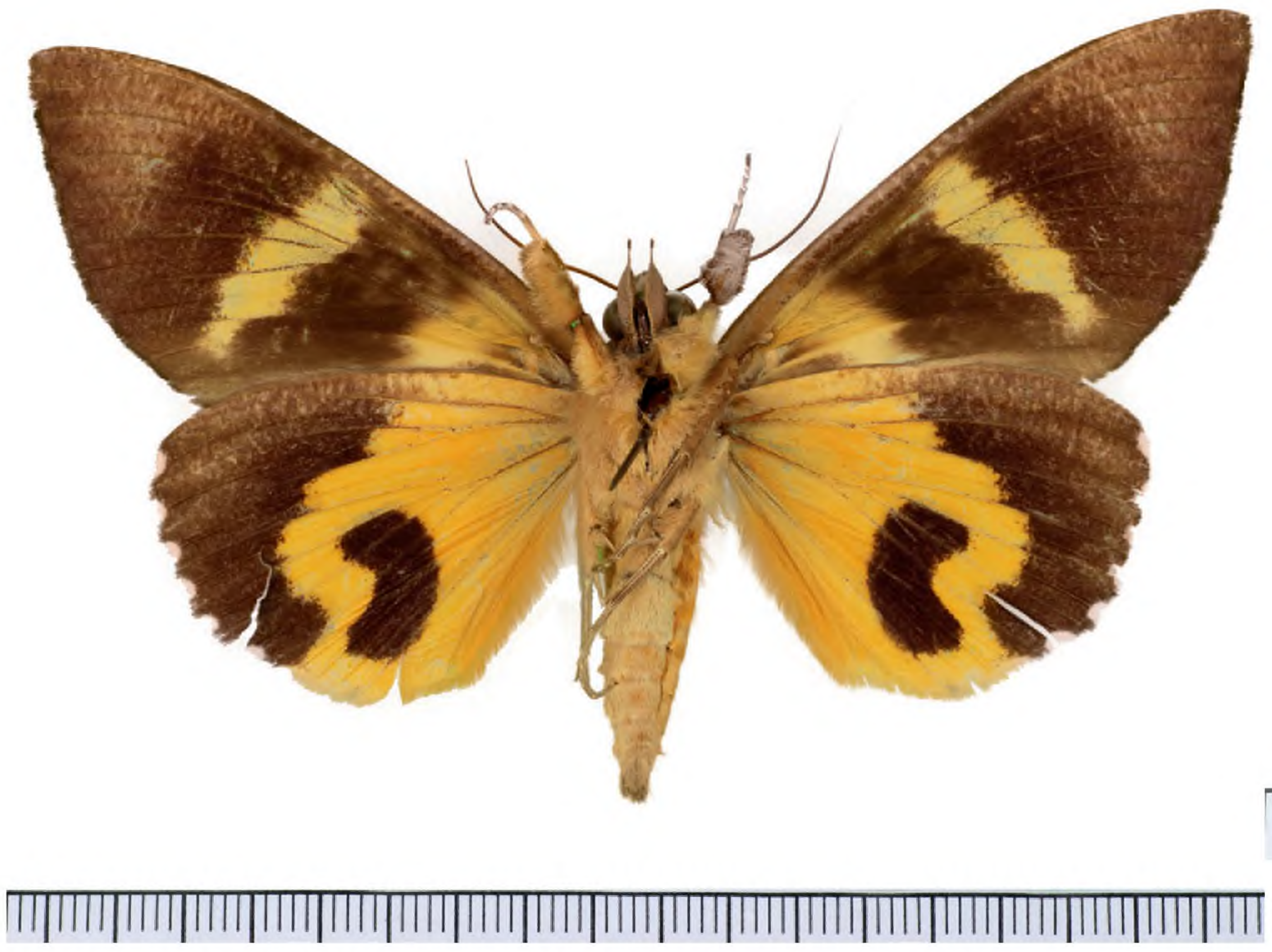

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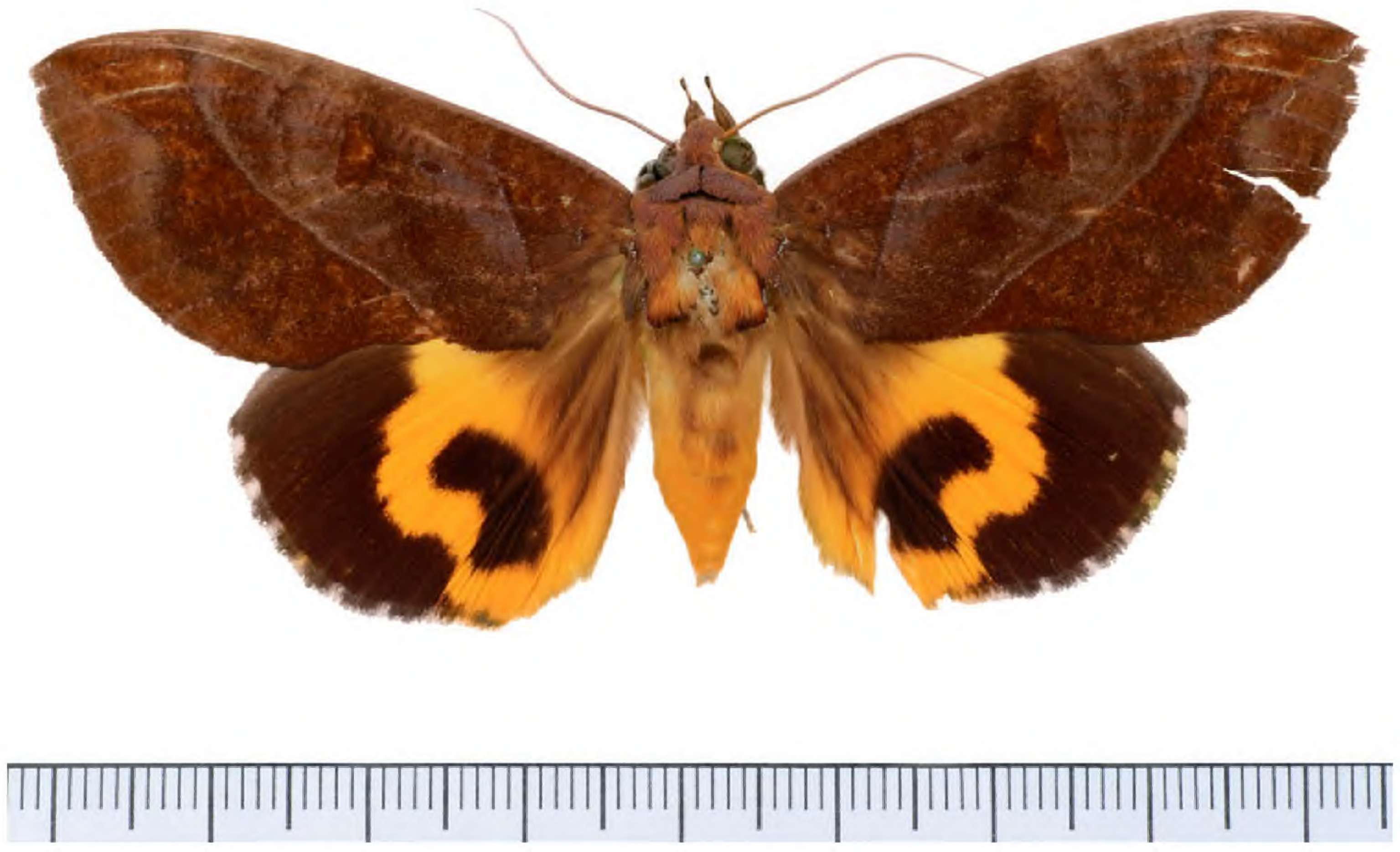

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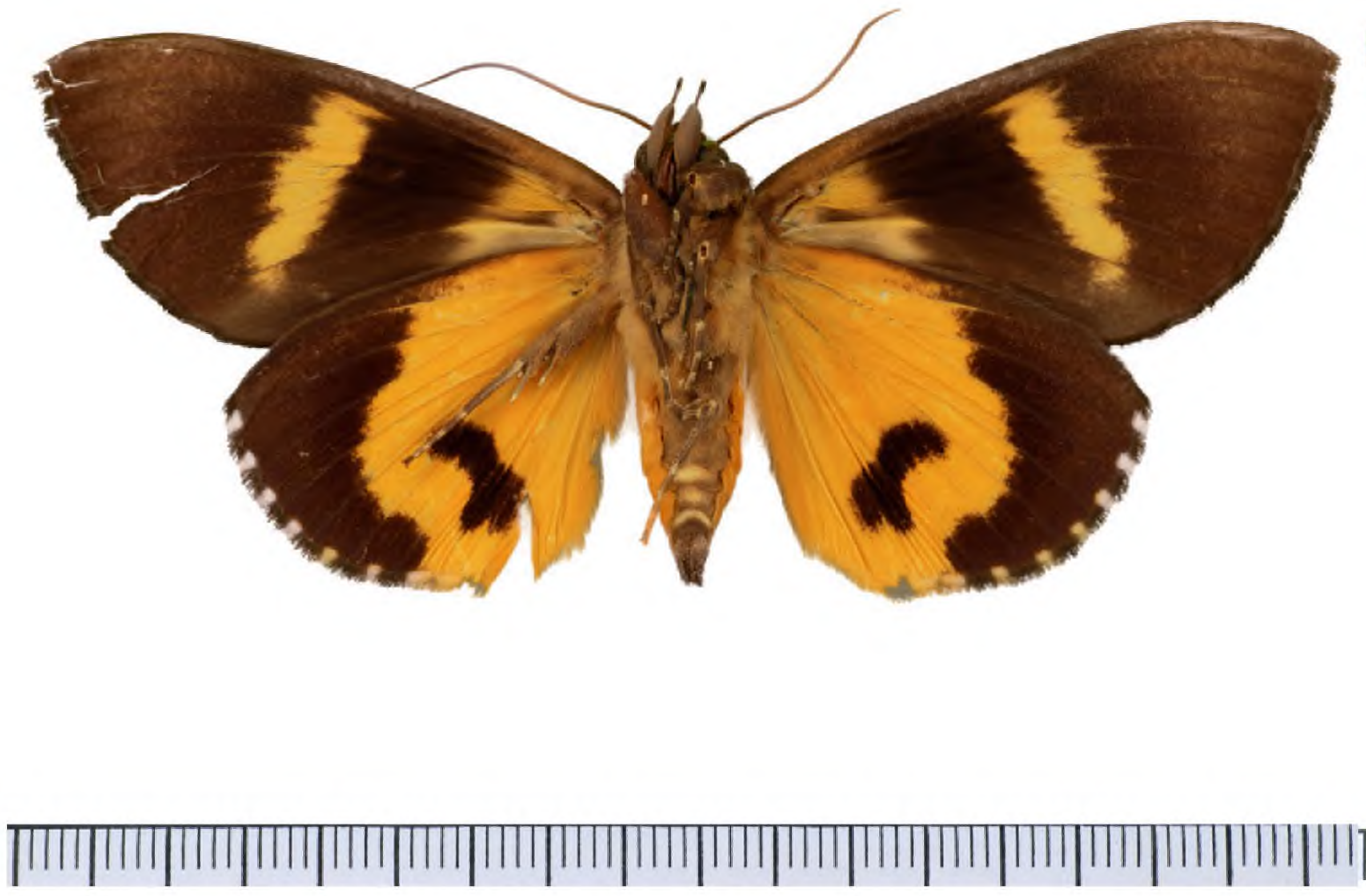

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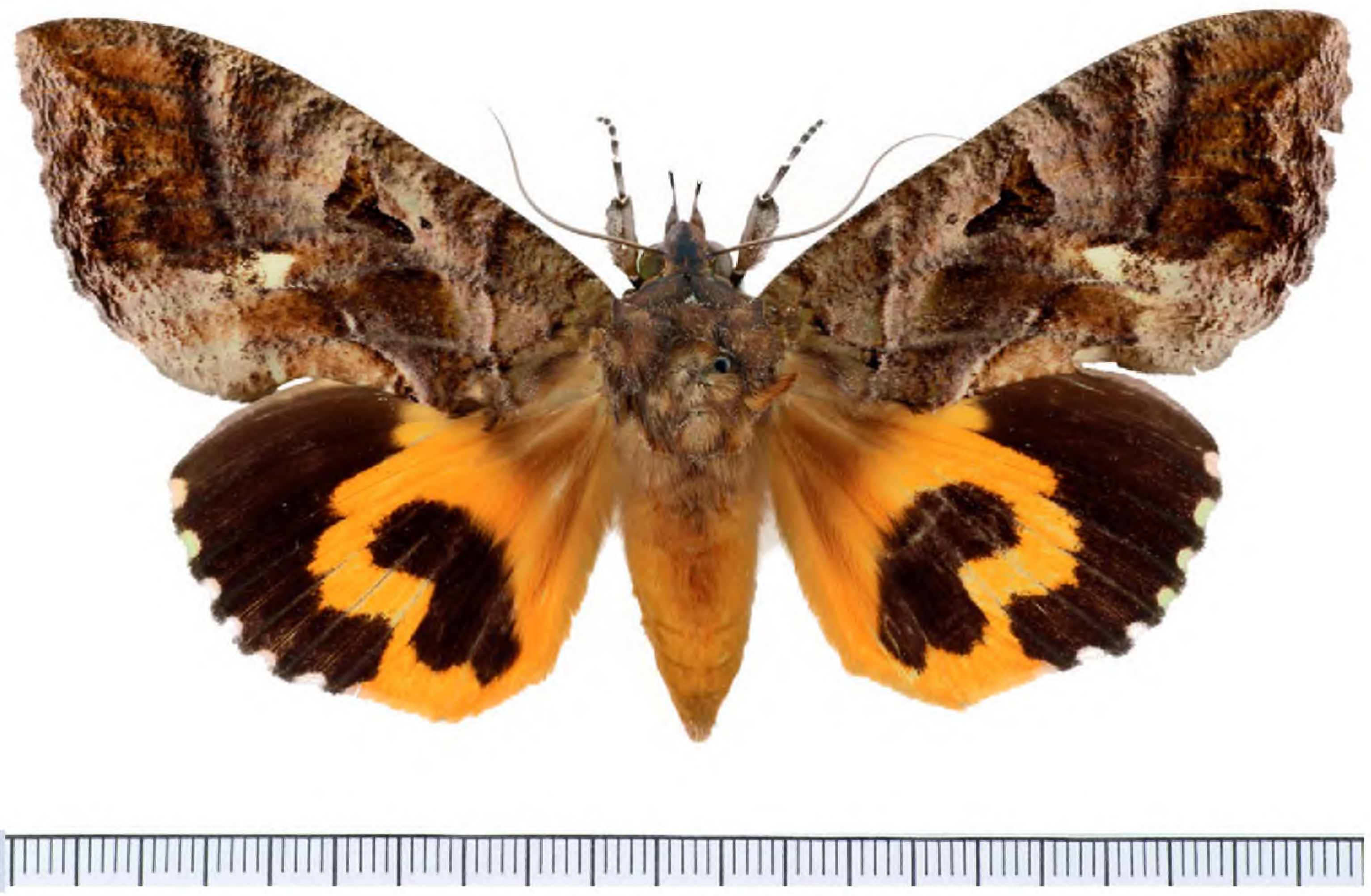

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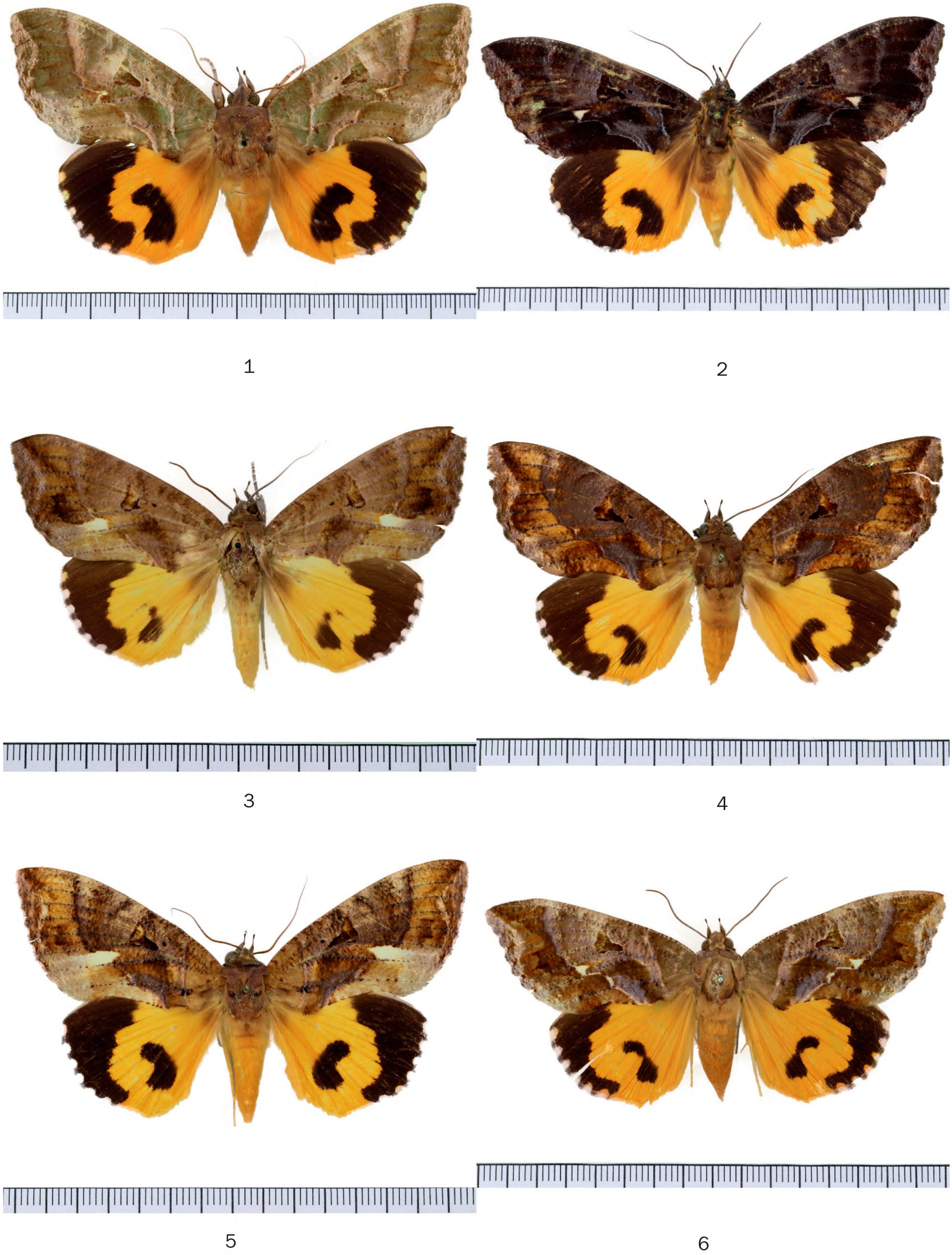
Figures 1-6. Habitus of *Eudocima phalonia* (Linnaeus, 1763). 1 – ♂, New Caledonia; 2 – ditto, ♂, Solomon Islands (Isabel); 3 – ditto, ♂, same as 2 (underside); 4 – ditto, ♂, Solomon Islands (New Georgia group); 5 – ditto, ♂, same as 4 (underside); 6 – ditto, ♀, Fiji (Vanua Levu).

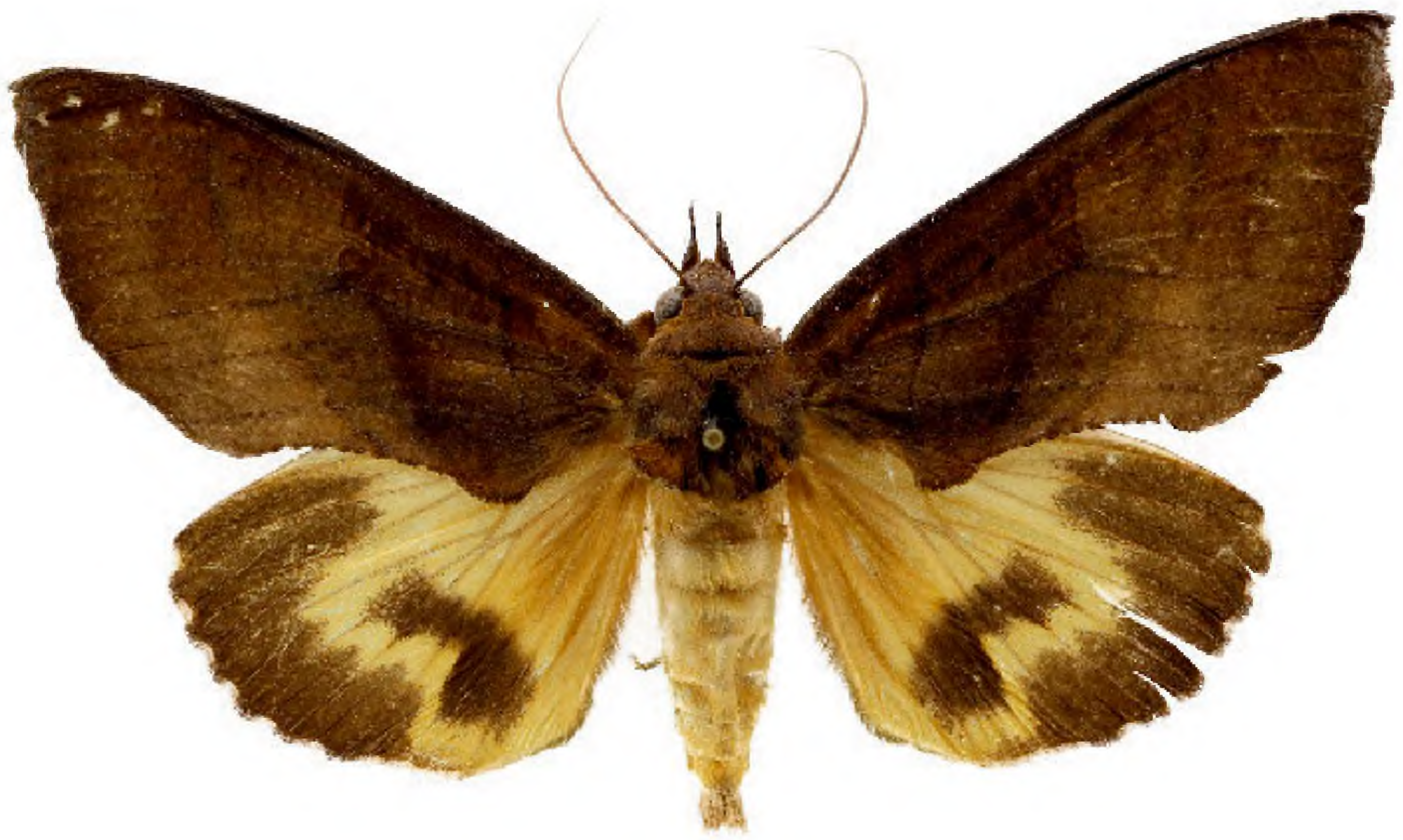
Plate 160



Figures 1-6. Habitus of *Eudocima phalonia* (Linnaeus, 1763). 1 – ♀, Fiji (Vanua Levu); 2 – ditto, ♀, Solomon Islands (Guadalcanal); 3 – ditto, ♀, Solomon Islands (Florida group); 4 – ditto, ♀, Solomon Islands (Choiseul); 5 – ditto, ♀, Palau (Koror); 6 – ditto, ♀, Samoa (Upolu).

Plate 161

Zilli, A., Brou, V.A., Klem C., Zaspel, J.: The *Eudocima* Billberg, 1820 of the Australian Region (Lepidoptera) ...



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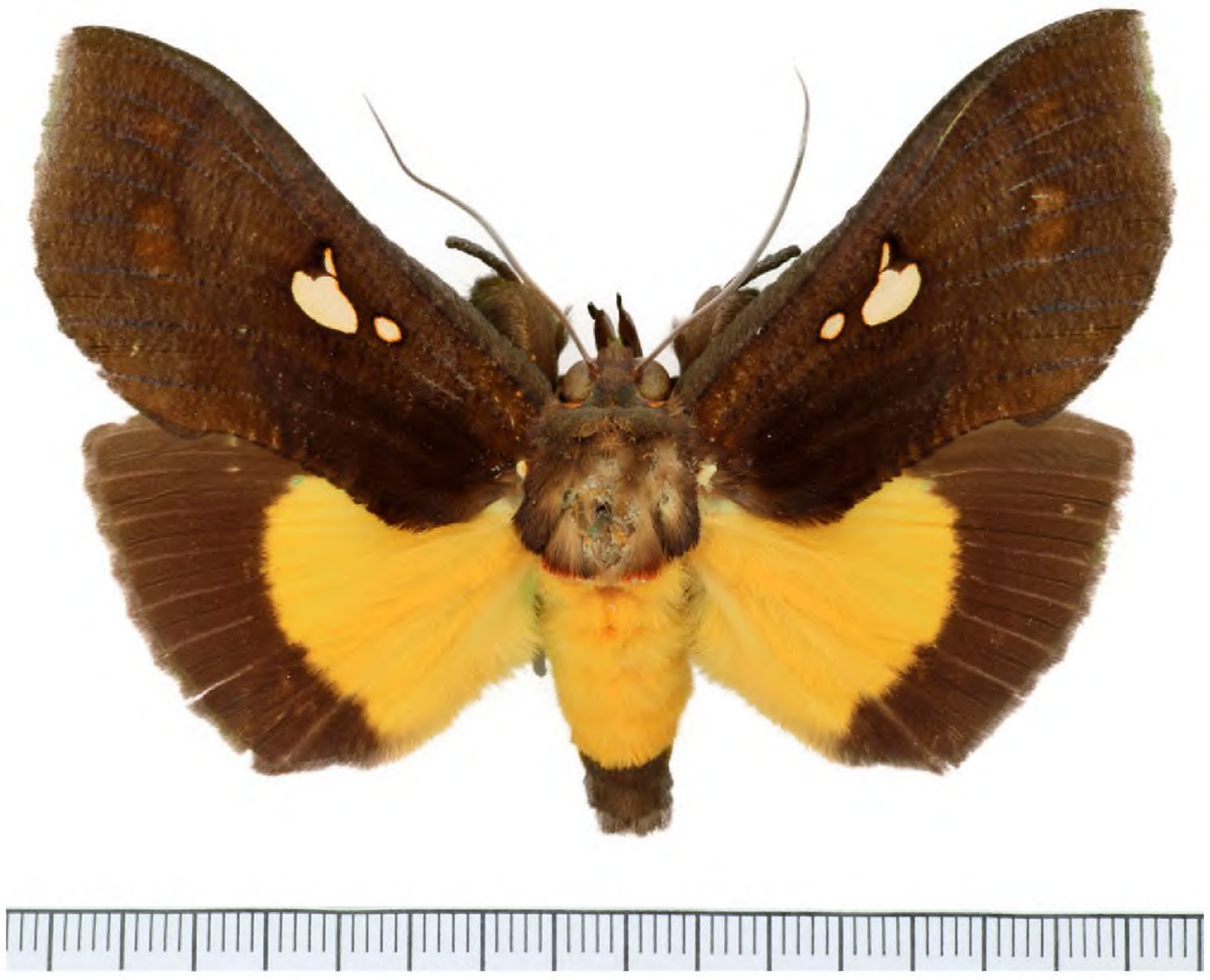

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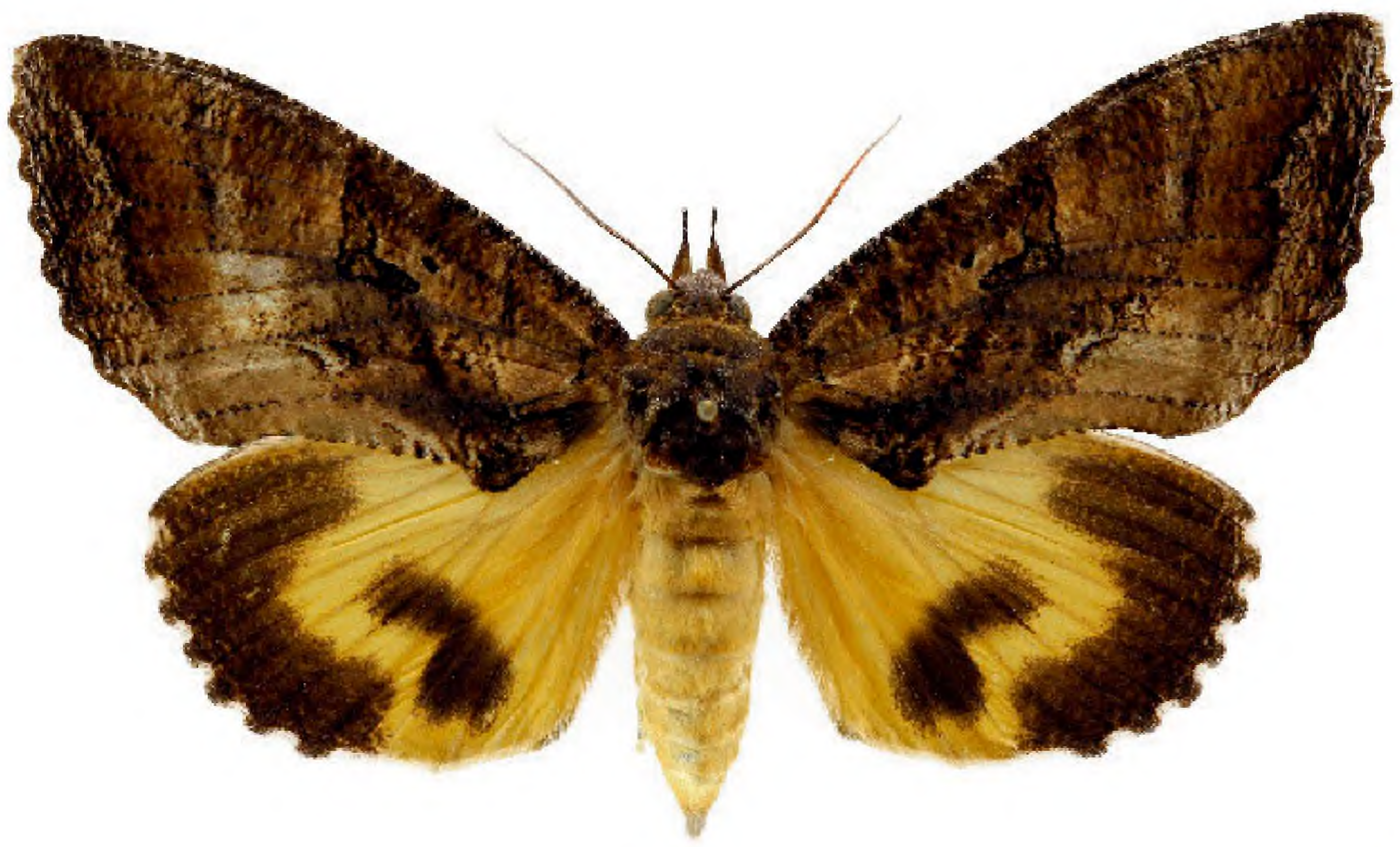

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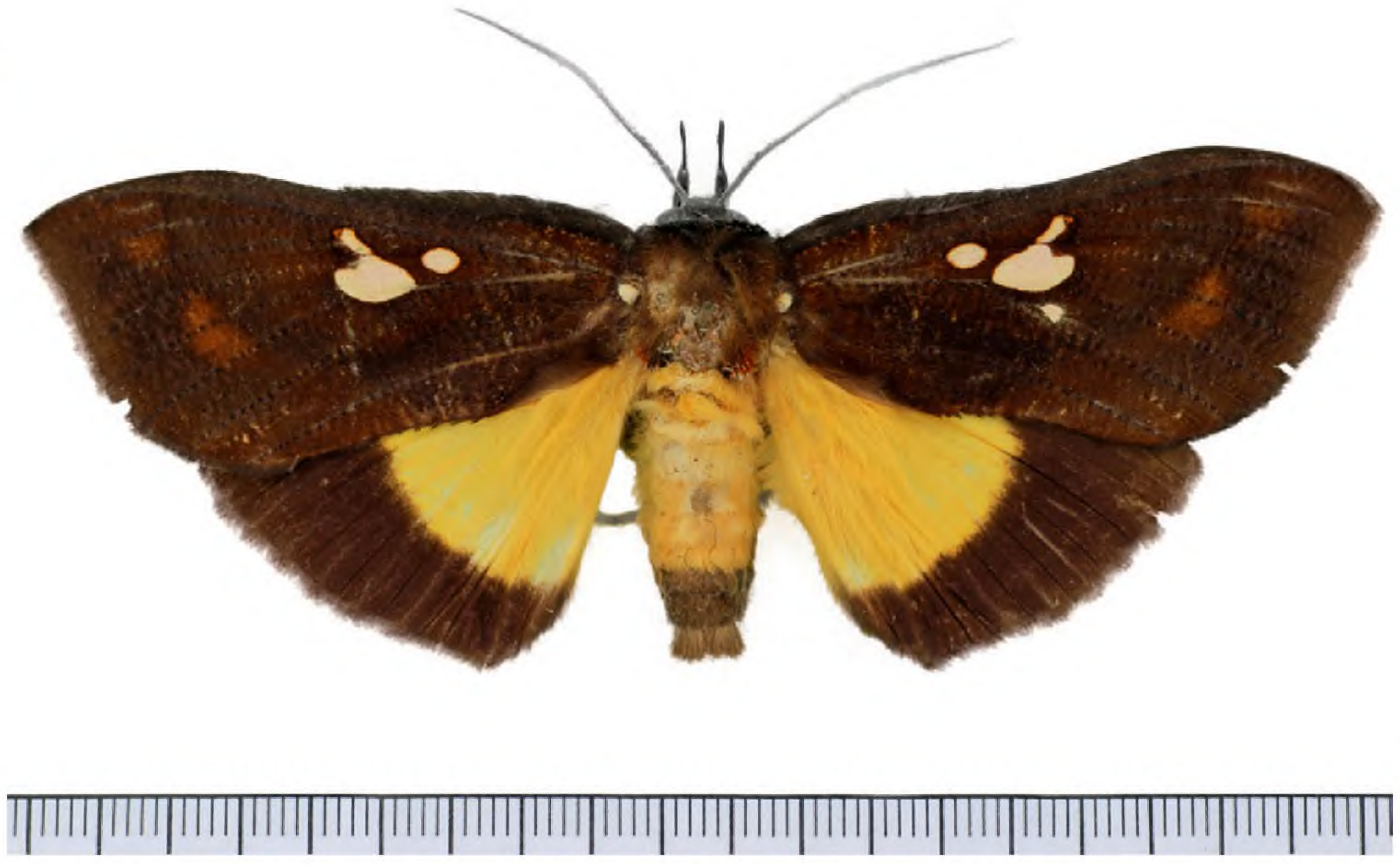

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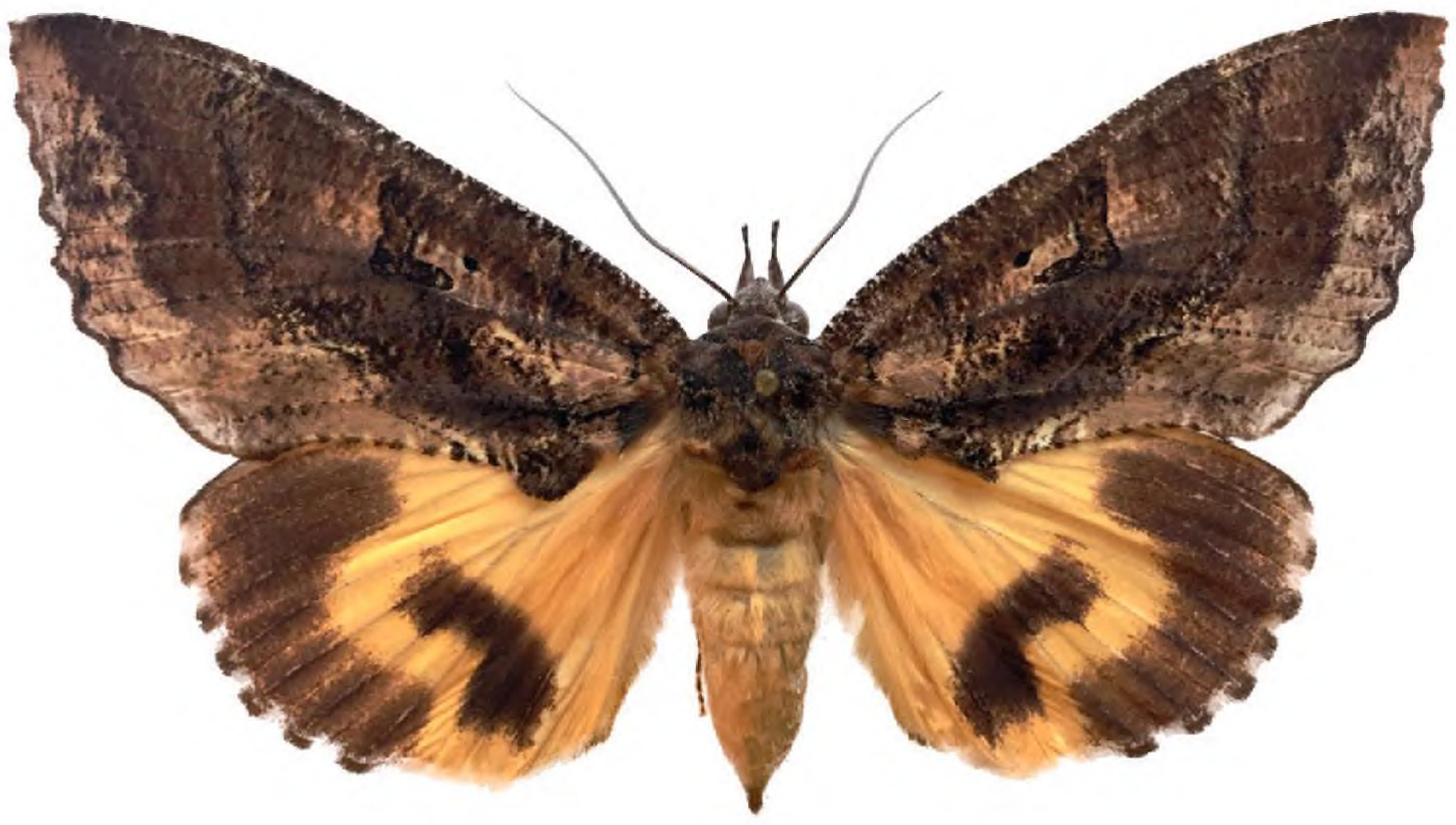

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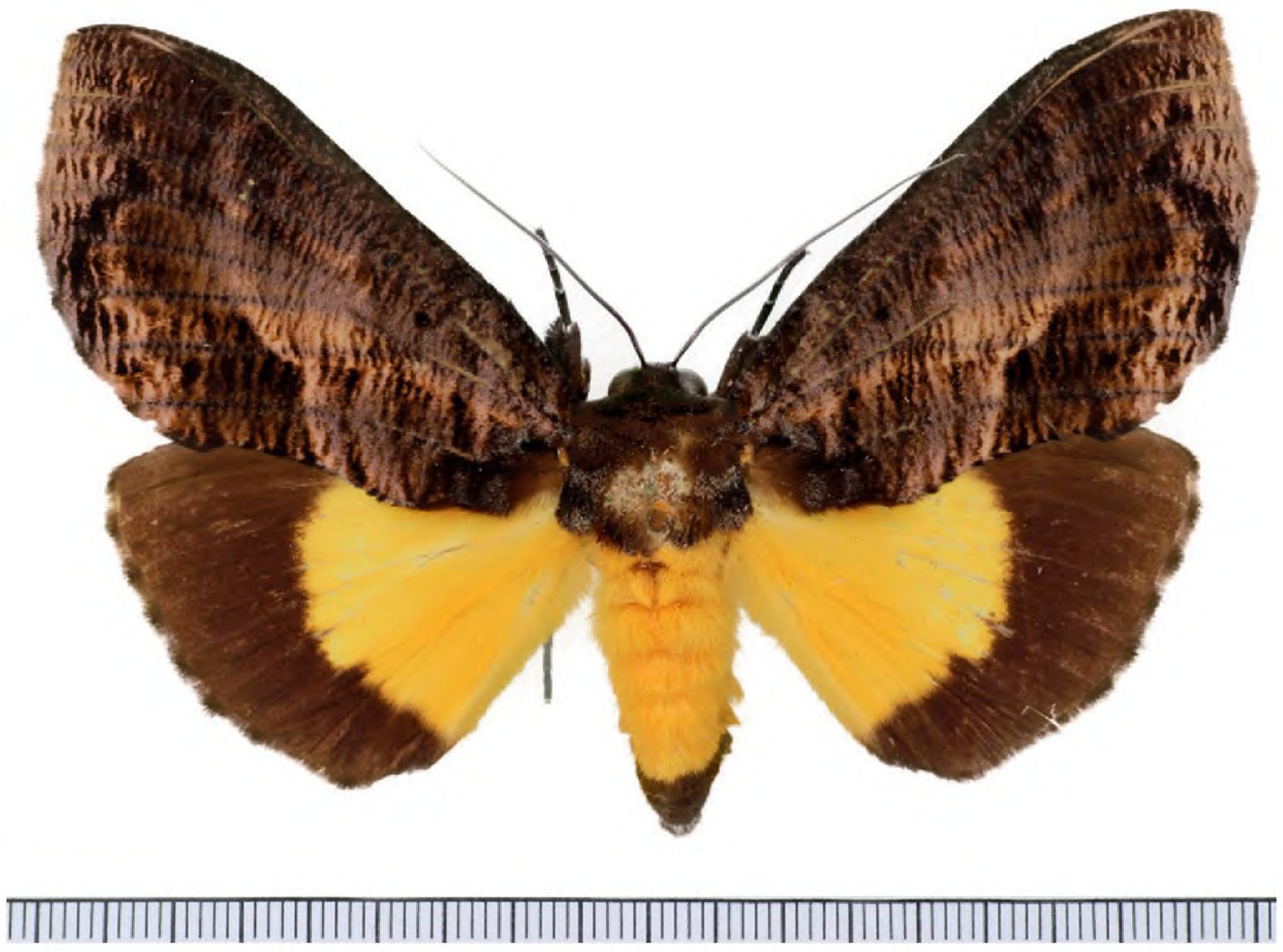

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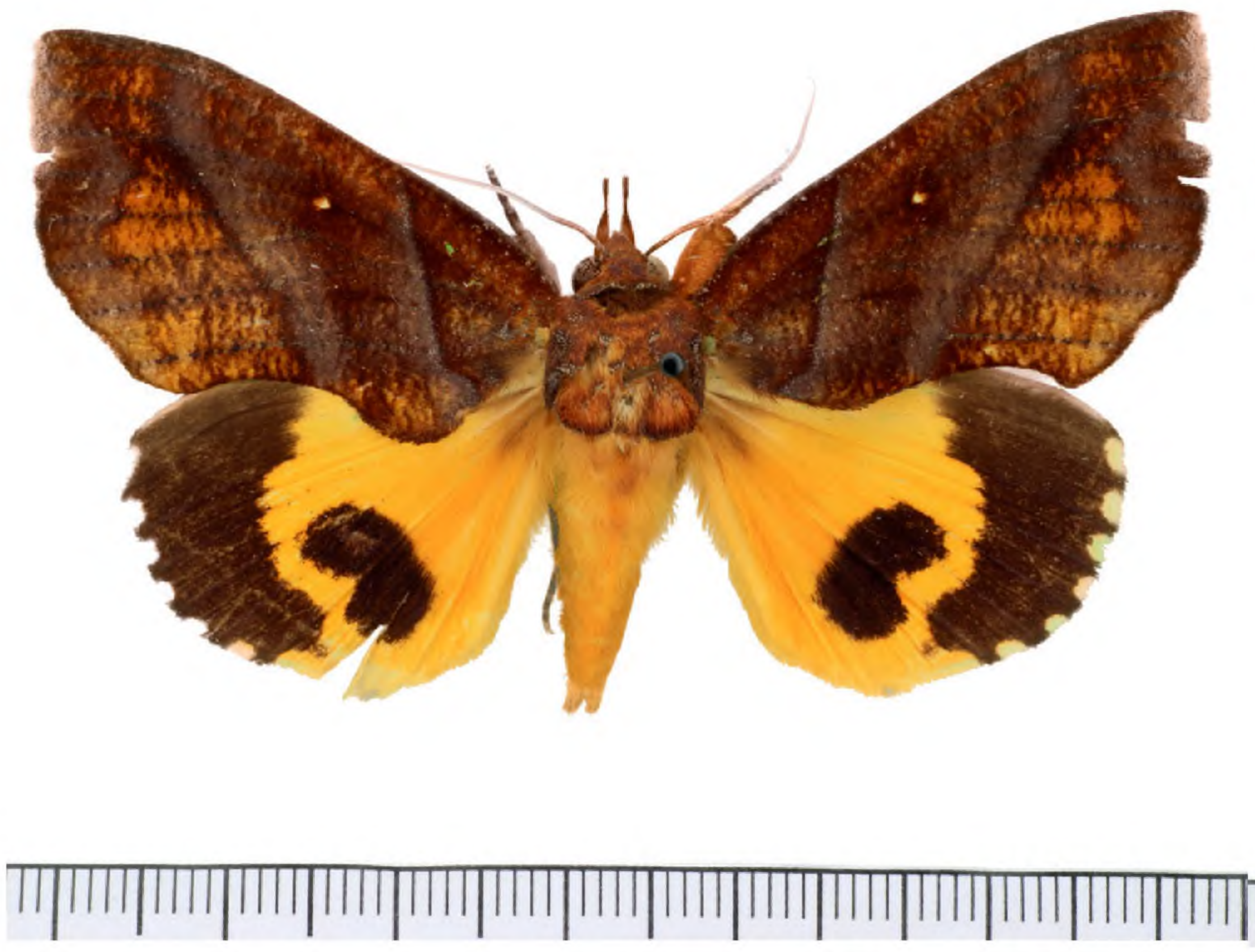
Figures 1-6. Habitus of *Eudocima* species. 1 – *E. steppingstonia* sp. nov., holotype ♂, Marquesas Islands (Fatu Hiva); 2 – ditto, paratype ♀, Marquesas Islands (Fatu Hiva); 3 – ditto, paratype ♀, Marquesas (Fatu Hiva) (1-3 courtesy of NMNH Washington); 4 – *E. kuehni* (Pagenstecher, 1886), ♂, New Guinea; 5 – ditto, ♂ (holotype *Lagoptera pratti* Bethune-Baker, 1906), New Guinea; 6 – ditto, ♀, New Ireland.

Plate 162



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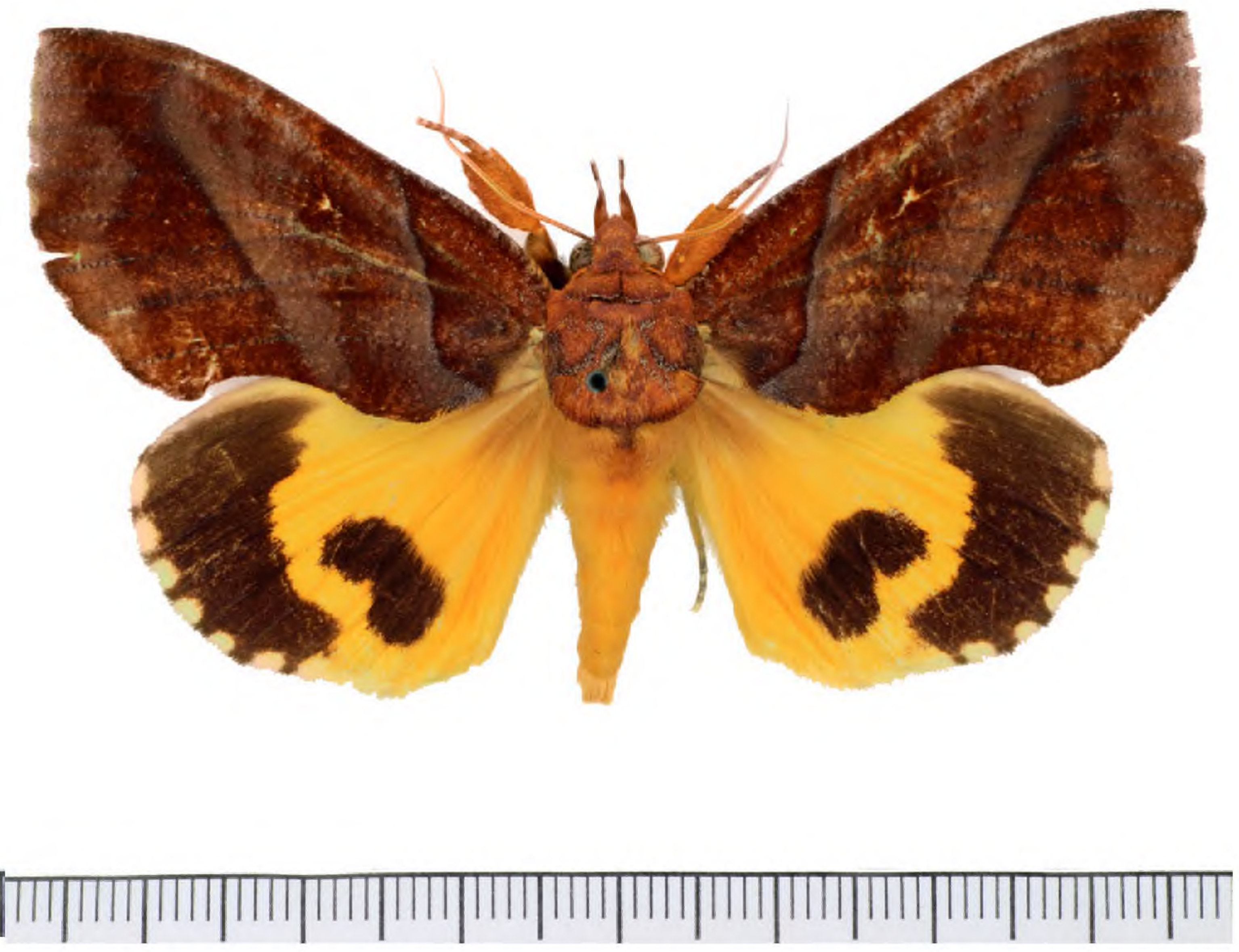

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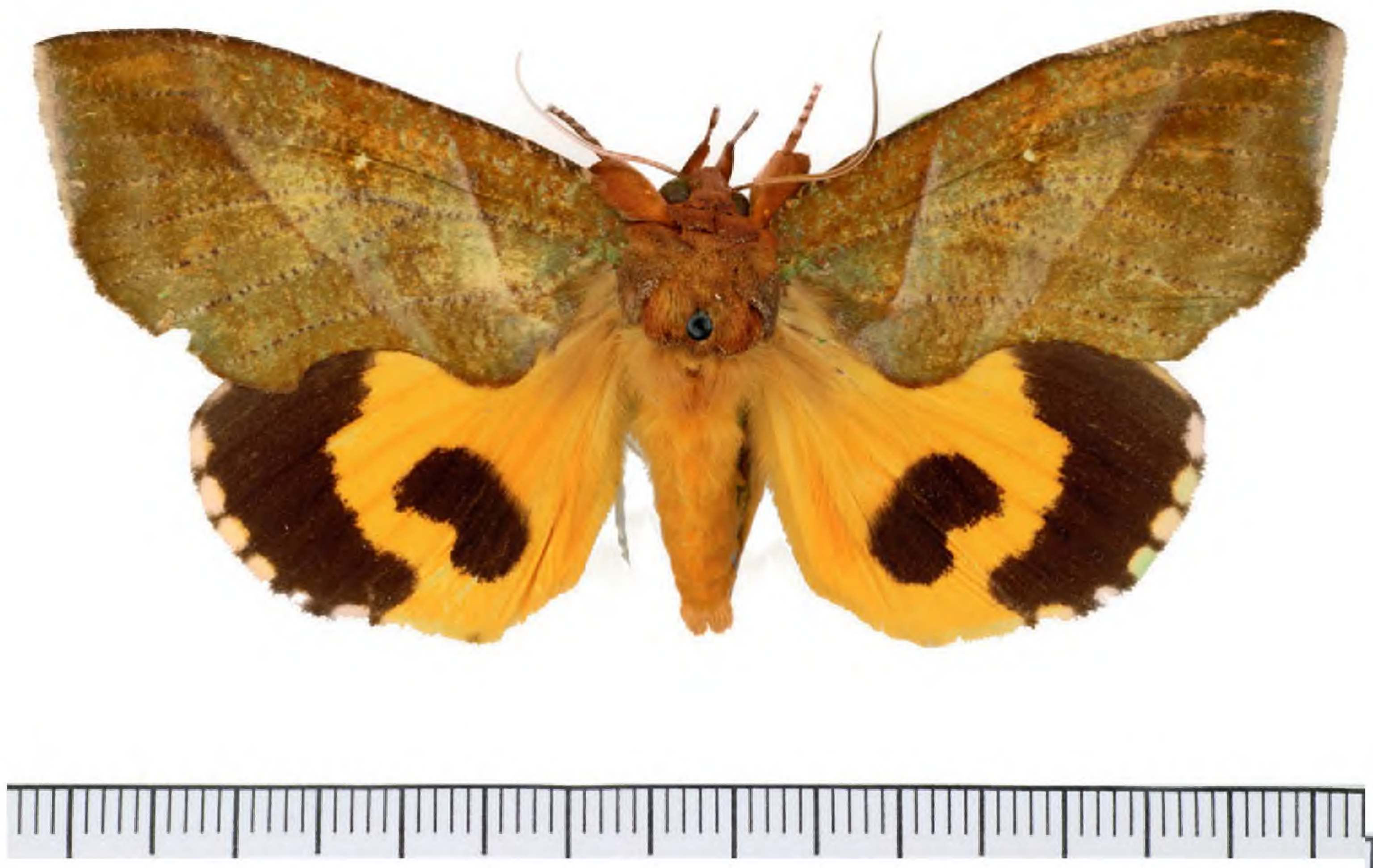

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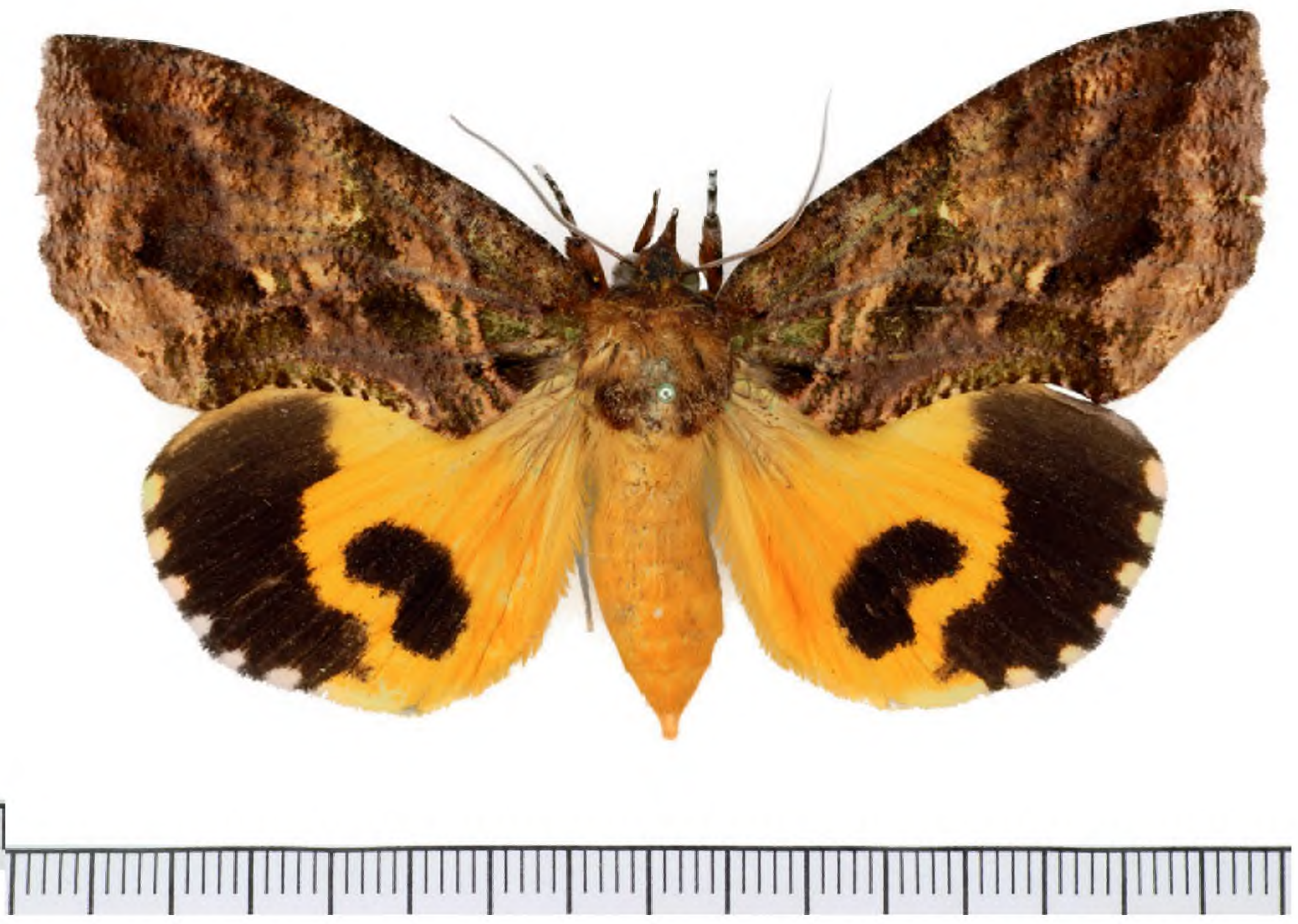

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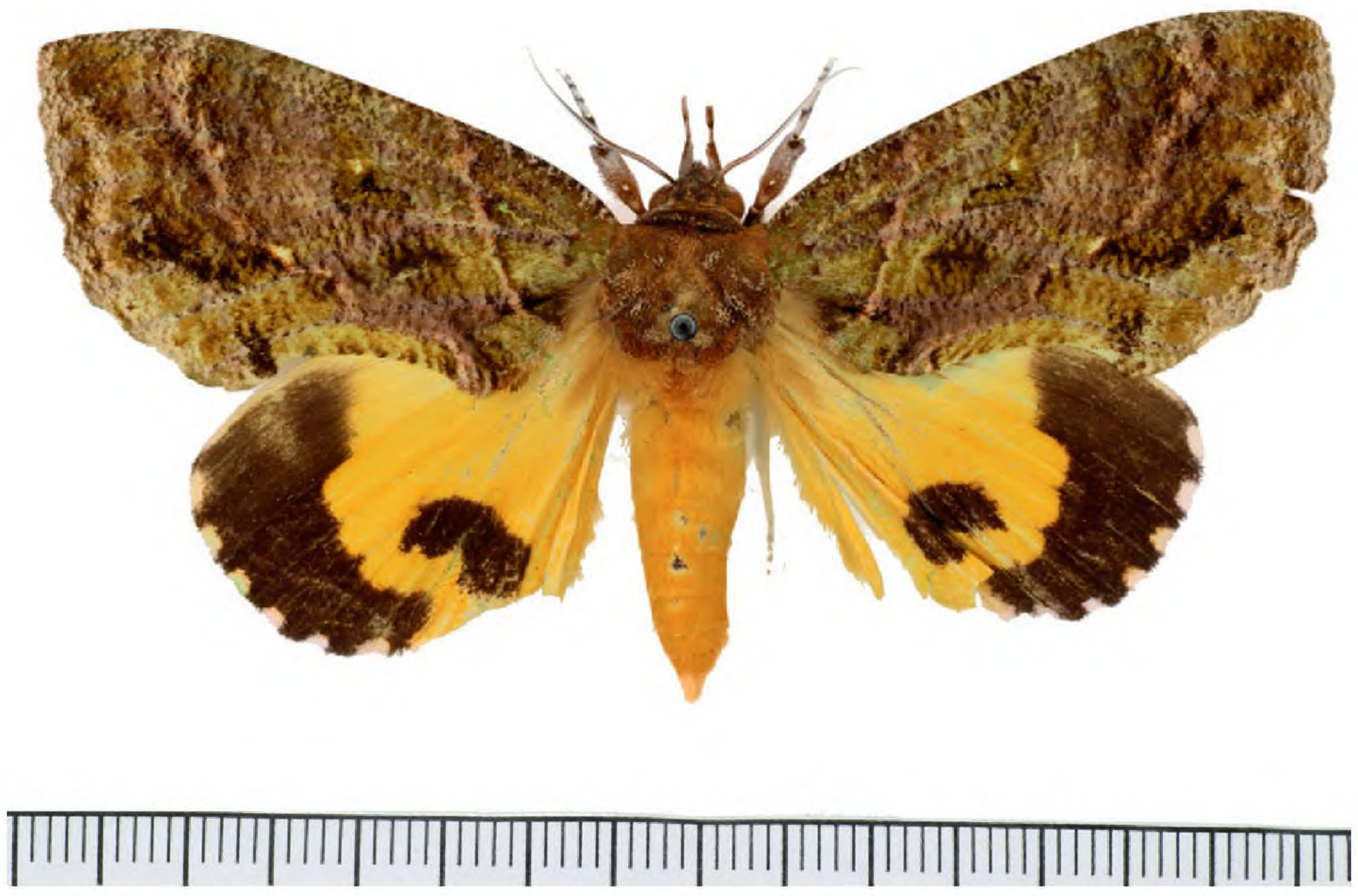

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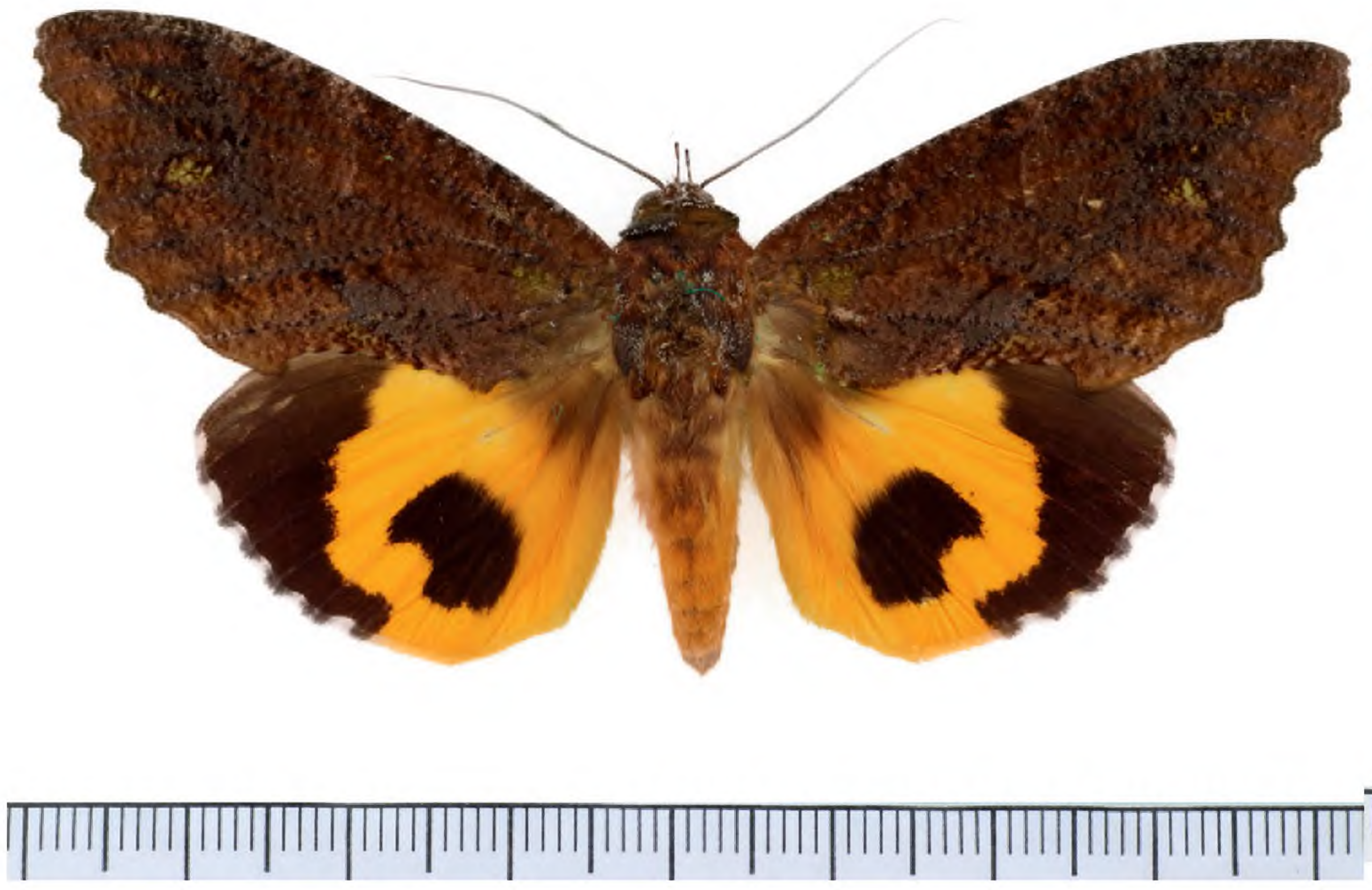
Figures 1-5. Habitus of *Eudocima paulii* (Robinson, 1968). 1 – ♂, Fiji (Viti Levu); 2 – ditto, ♂, Fiji (Viti Levu); 3 – ditto, ♂, Fiji (Viti Levu); 4 – ditto, ♀, Fiji (Viti Levu); 5 – ditto, paratype ♀, Fiji (Viti Levu).

Plate 163



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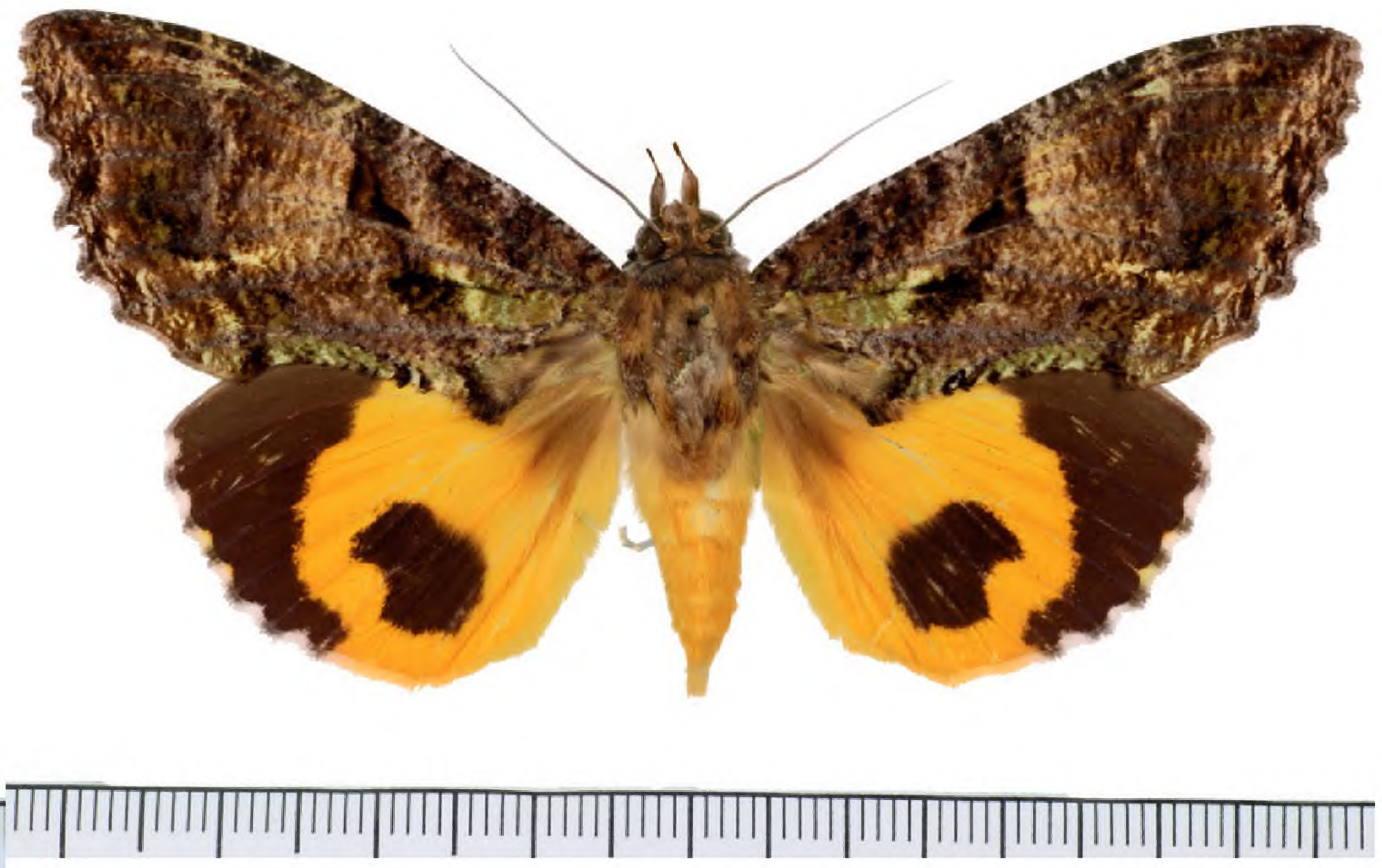

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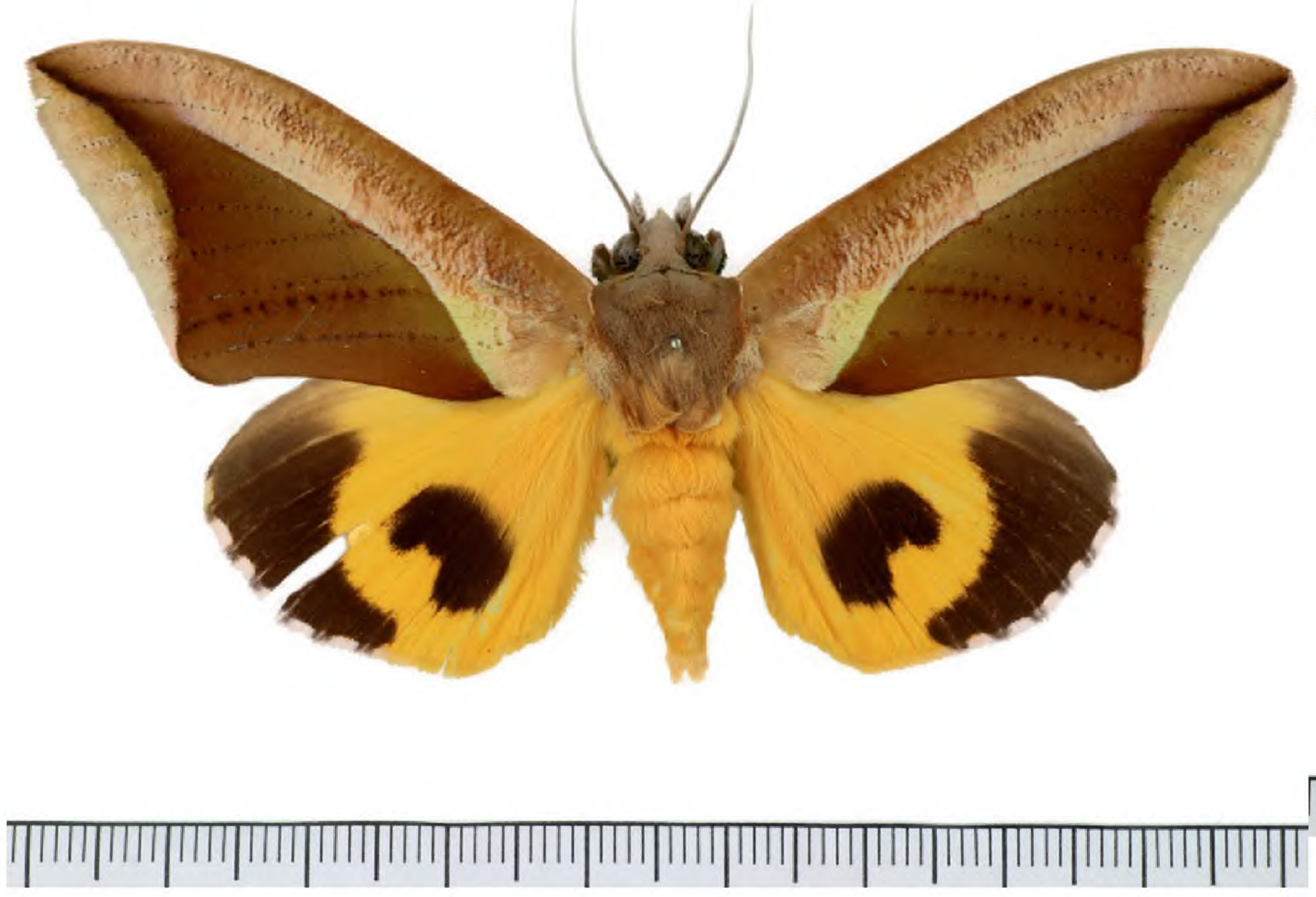

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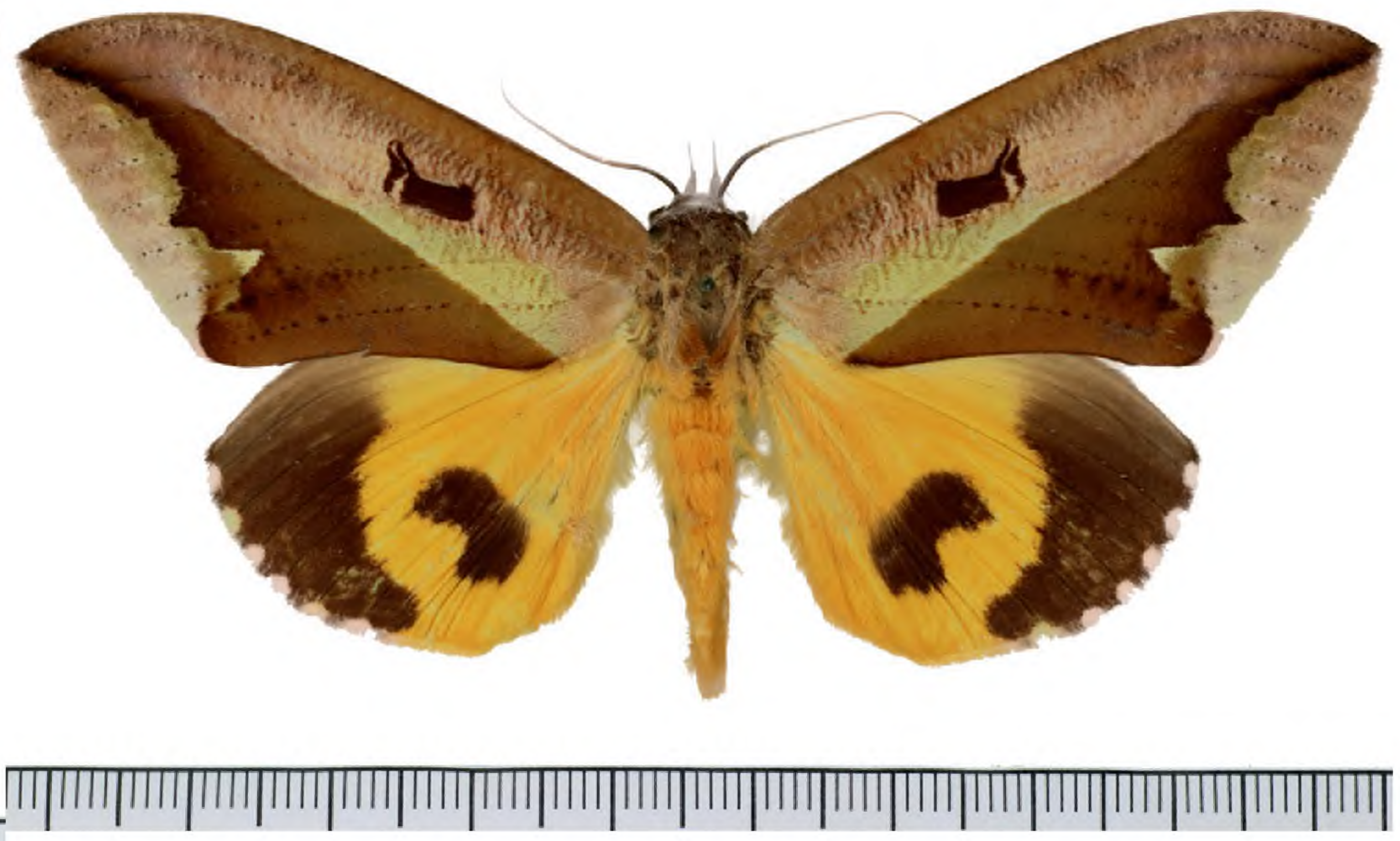

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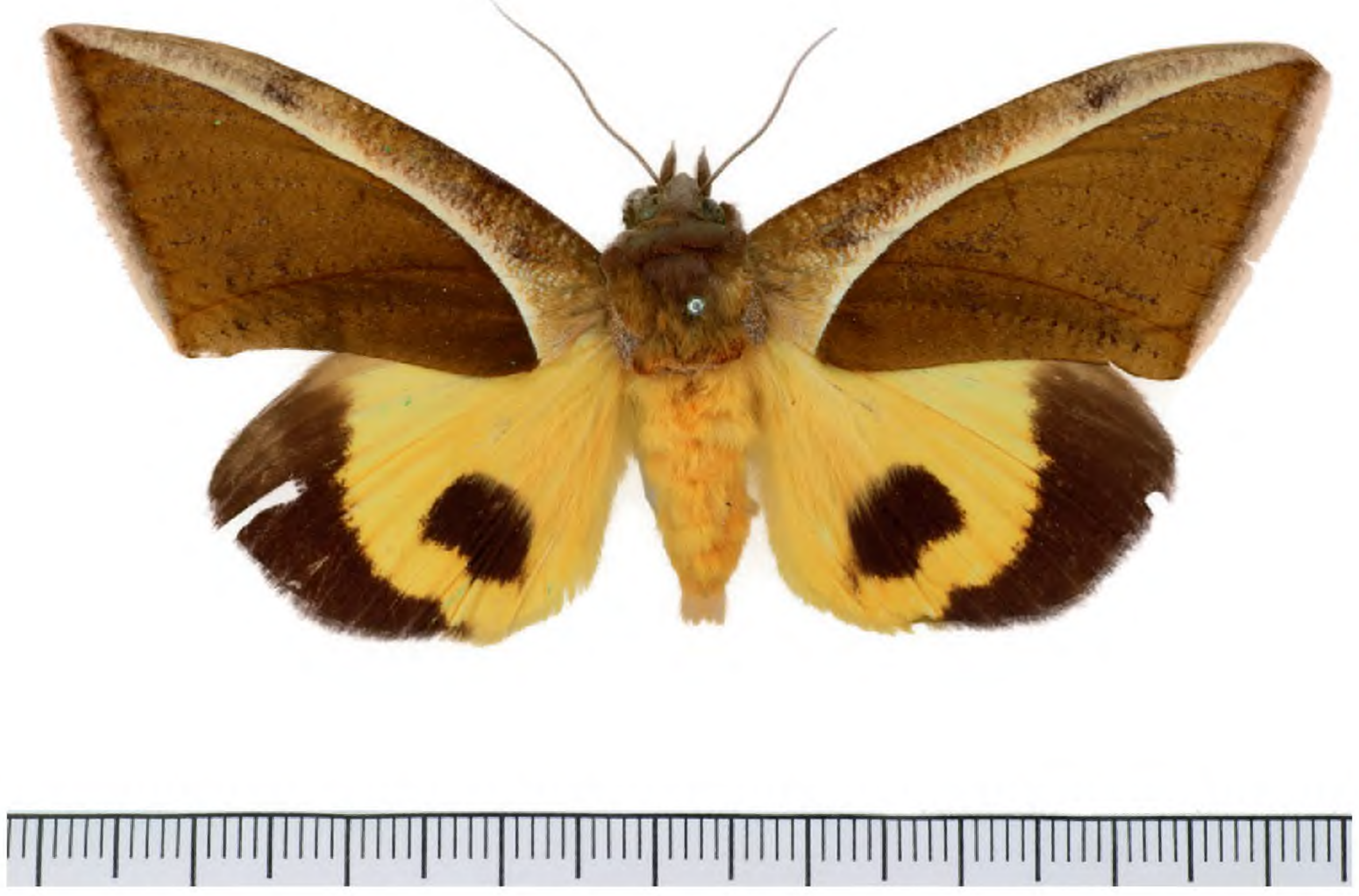

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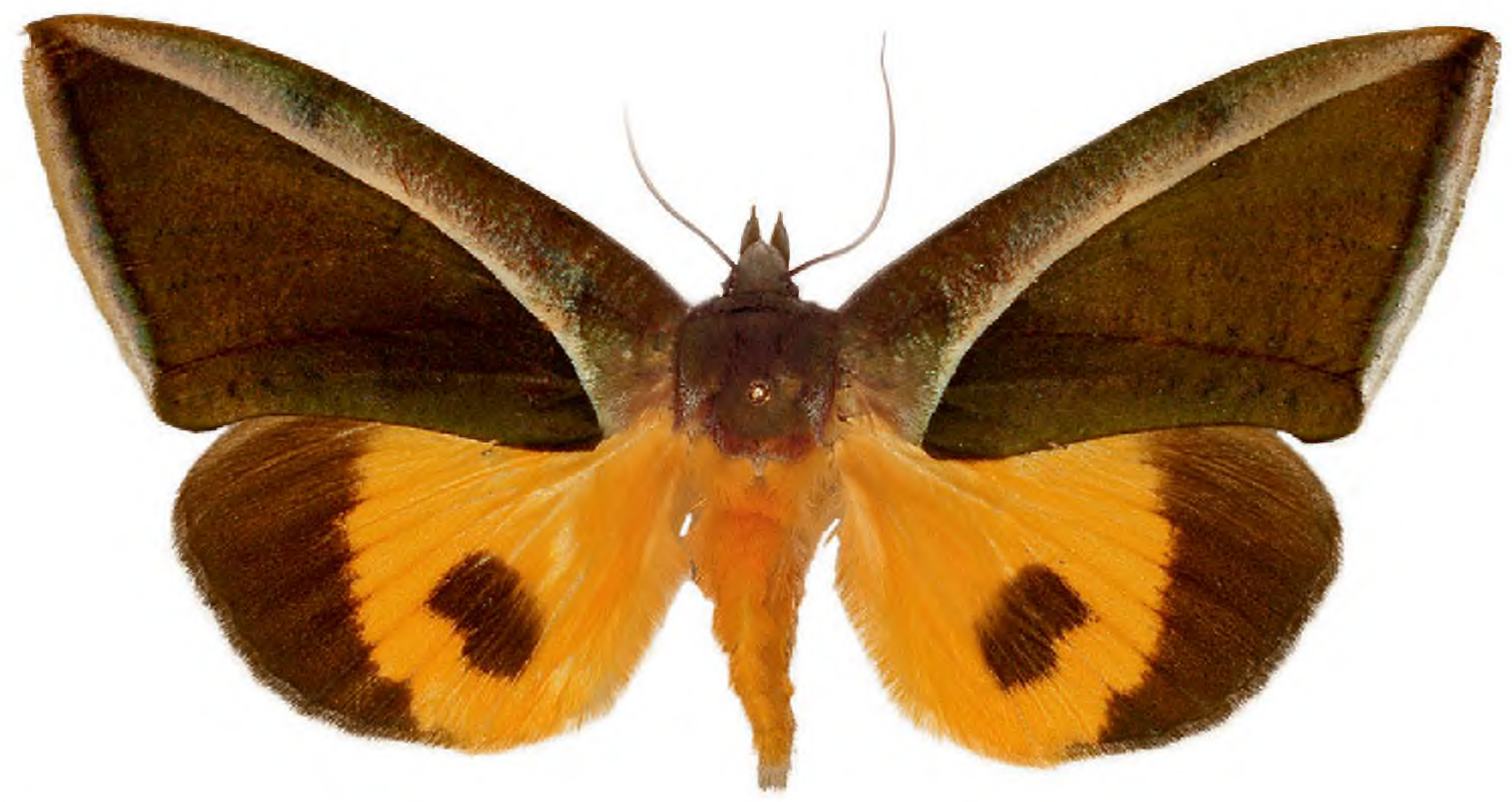
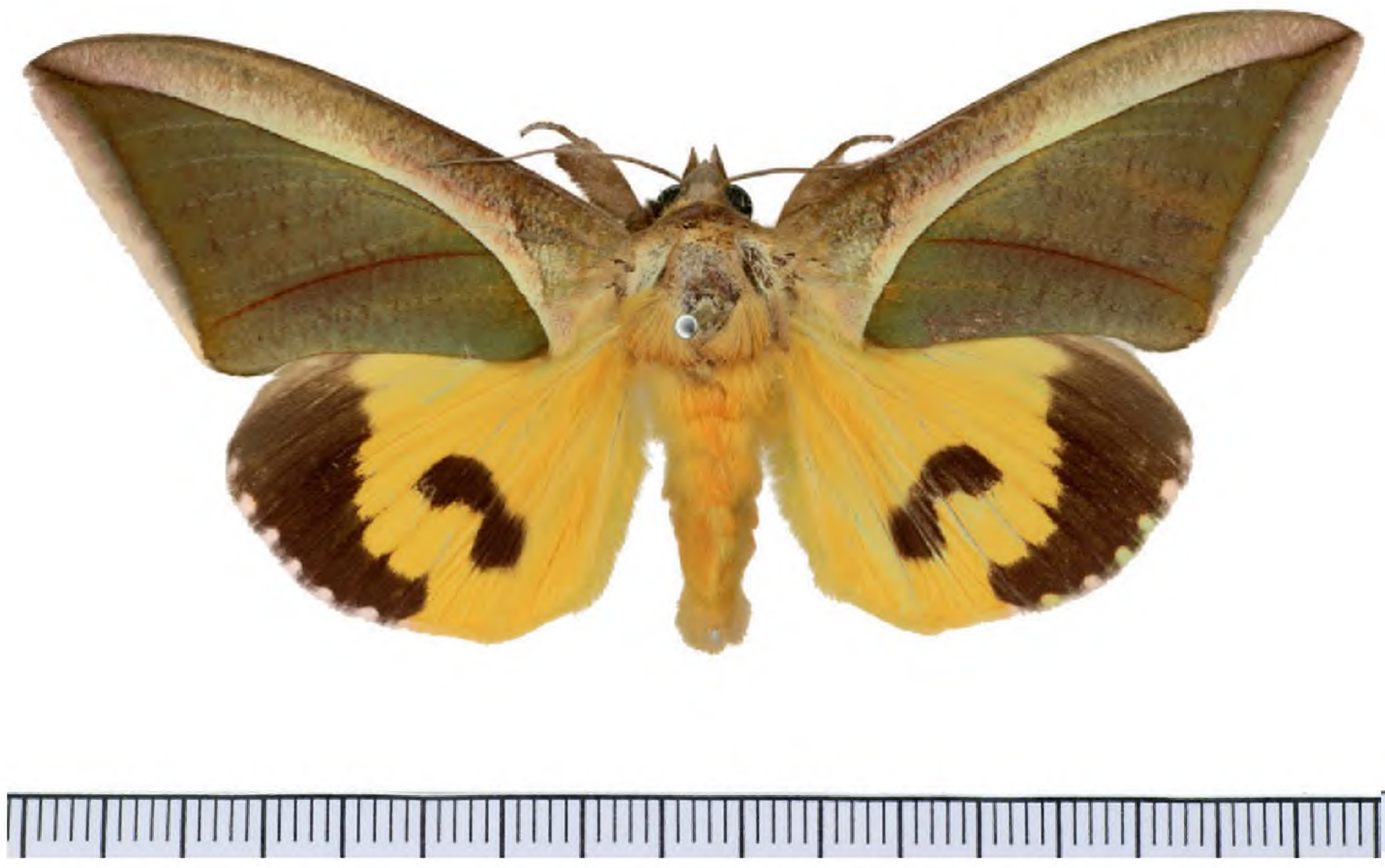


6

Figures 1-6. Habitus of *Eudocima* species. 1 – *E. jordani* (Holland, 1900), ♂, New Guinea; 2 – ditto, ♀, New Guinea; 3 – *E. dividens* (Walker, [1858]), ♂, Malay Peninsula; 4 – ditto, ♀, Borneo; 5 – *E. nigricilia* (A.E. Prout, 1924), holotype ♂, New Guinea; 6 – ditto, ♀, New Guinea (courtesy of NBC Leiden).

Plate 164

Zilli, A., Brou, V.A., Klem C., Zaspel, J.: The *Eudocima* Billberg, 1820 of the Australian Region (Lepidoptera) ...



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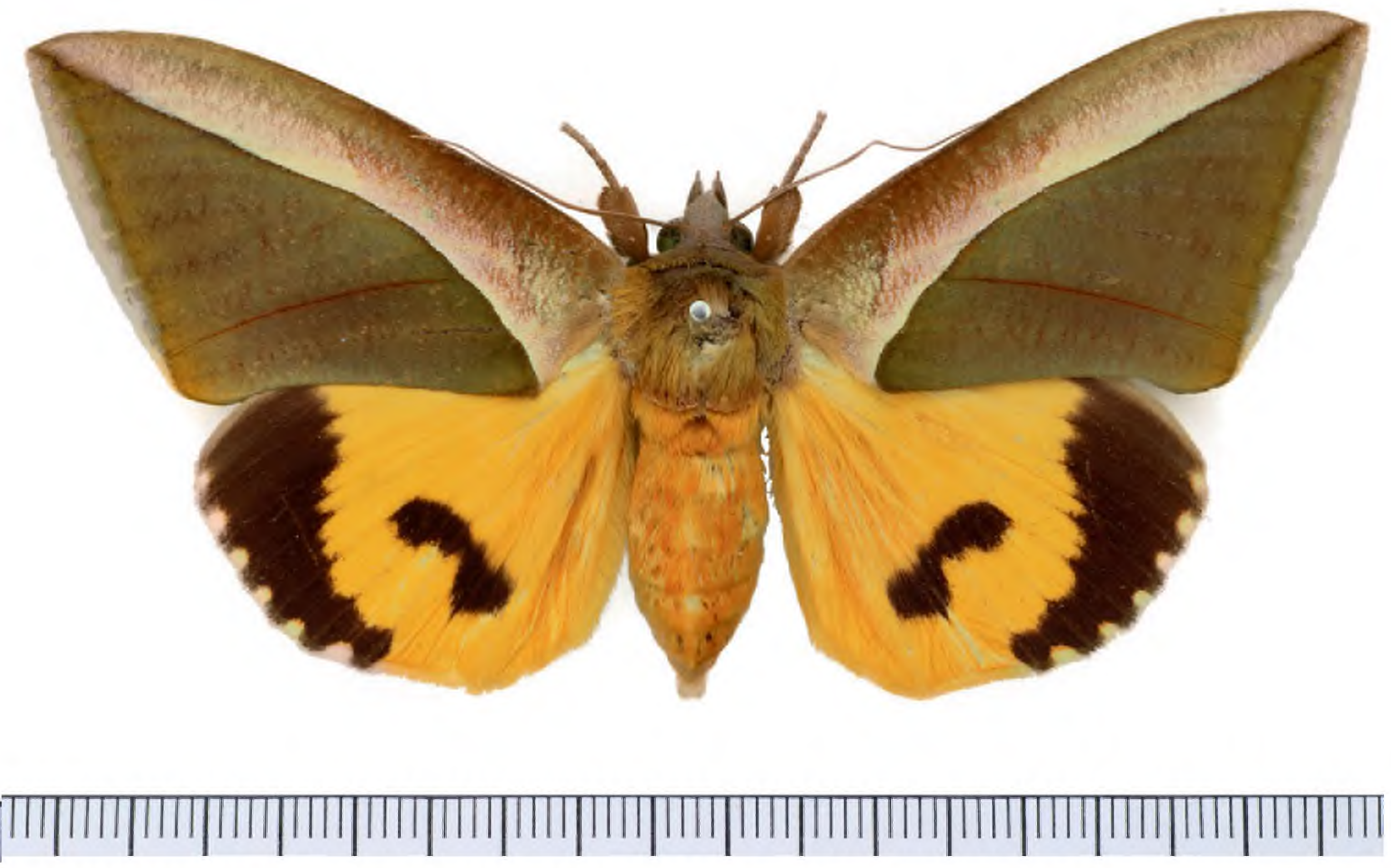

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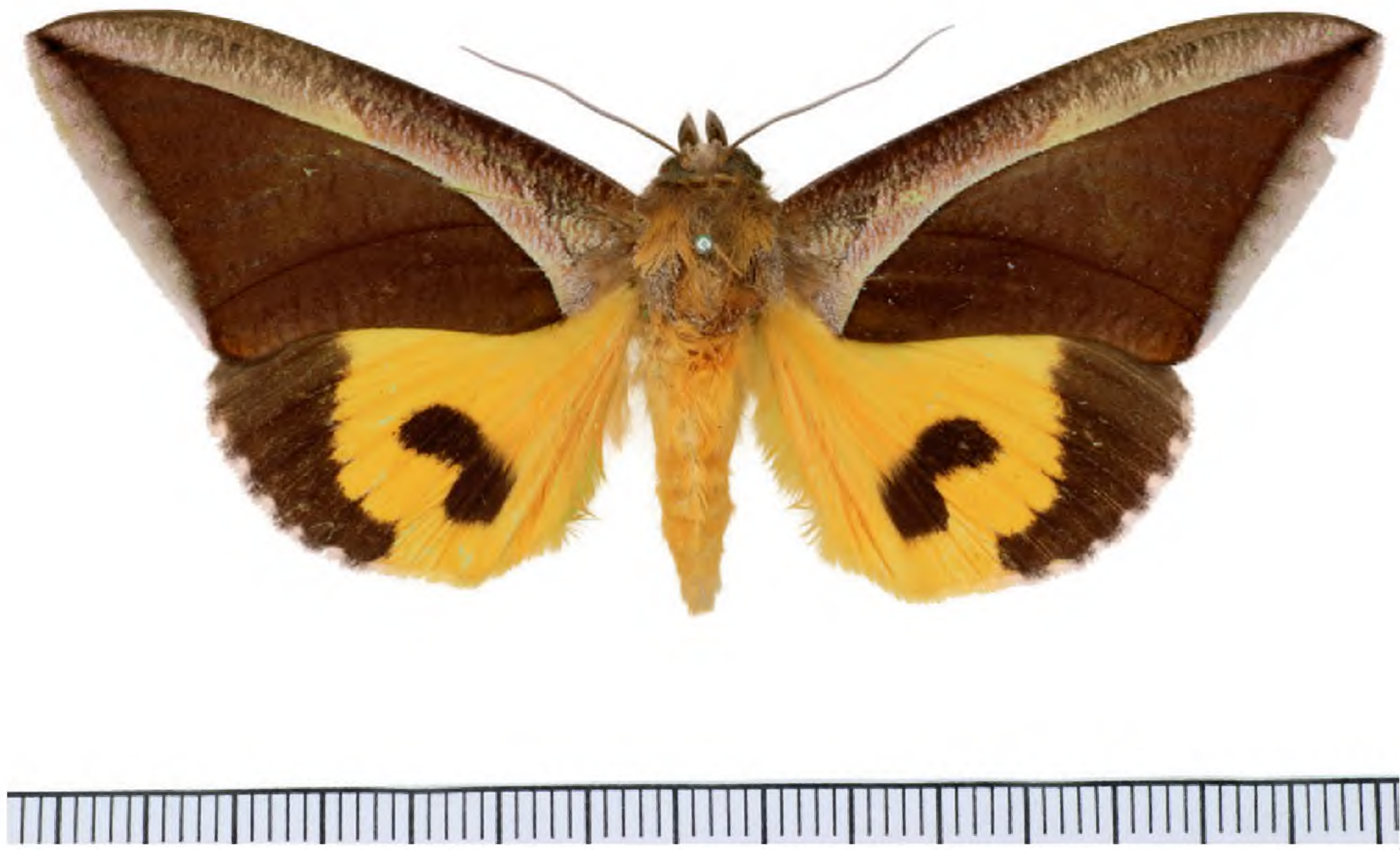

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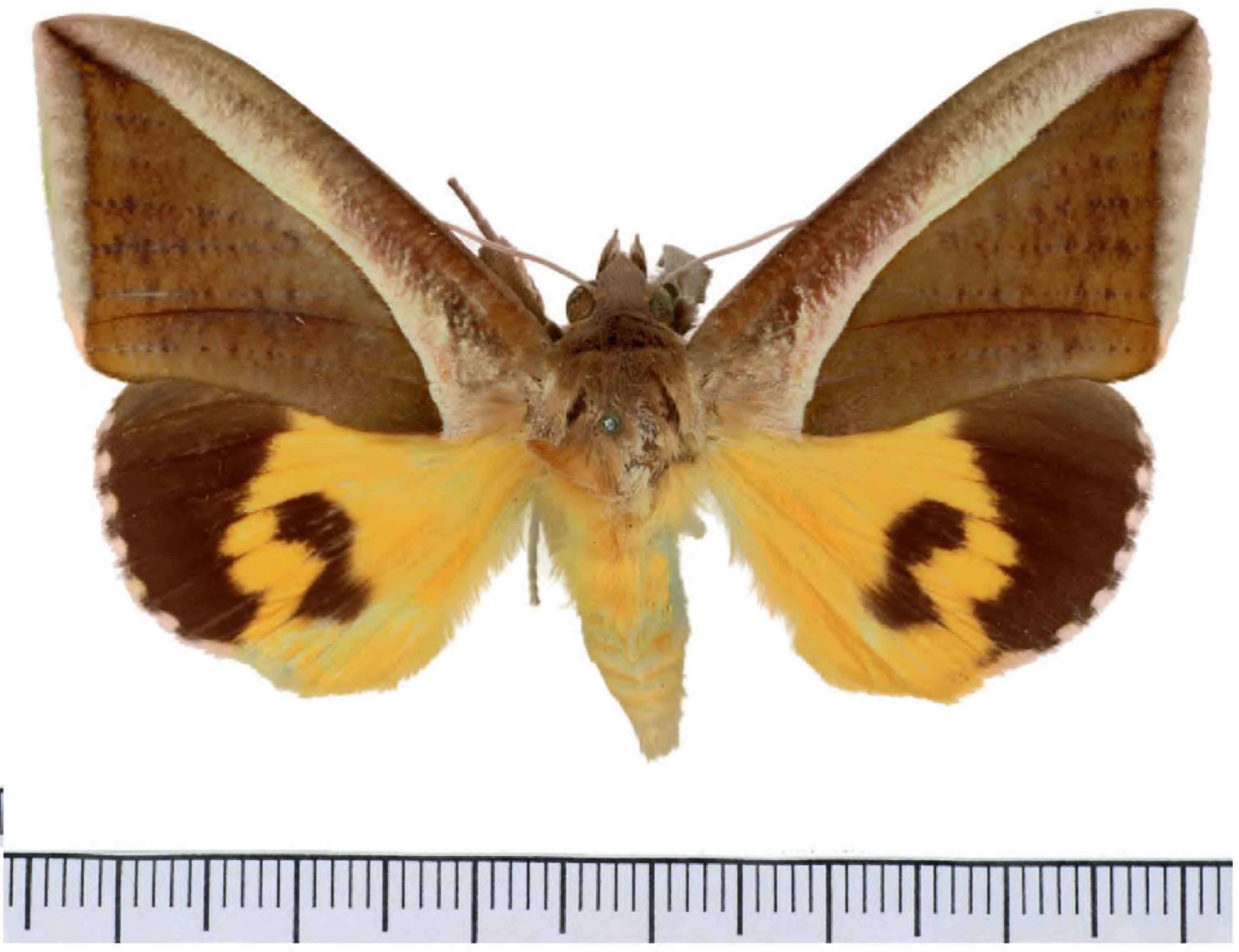

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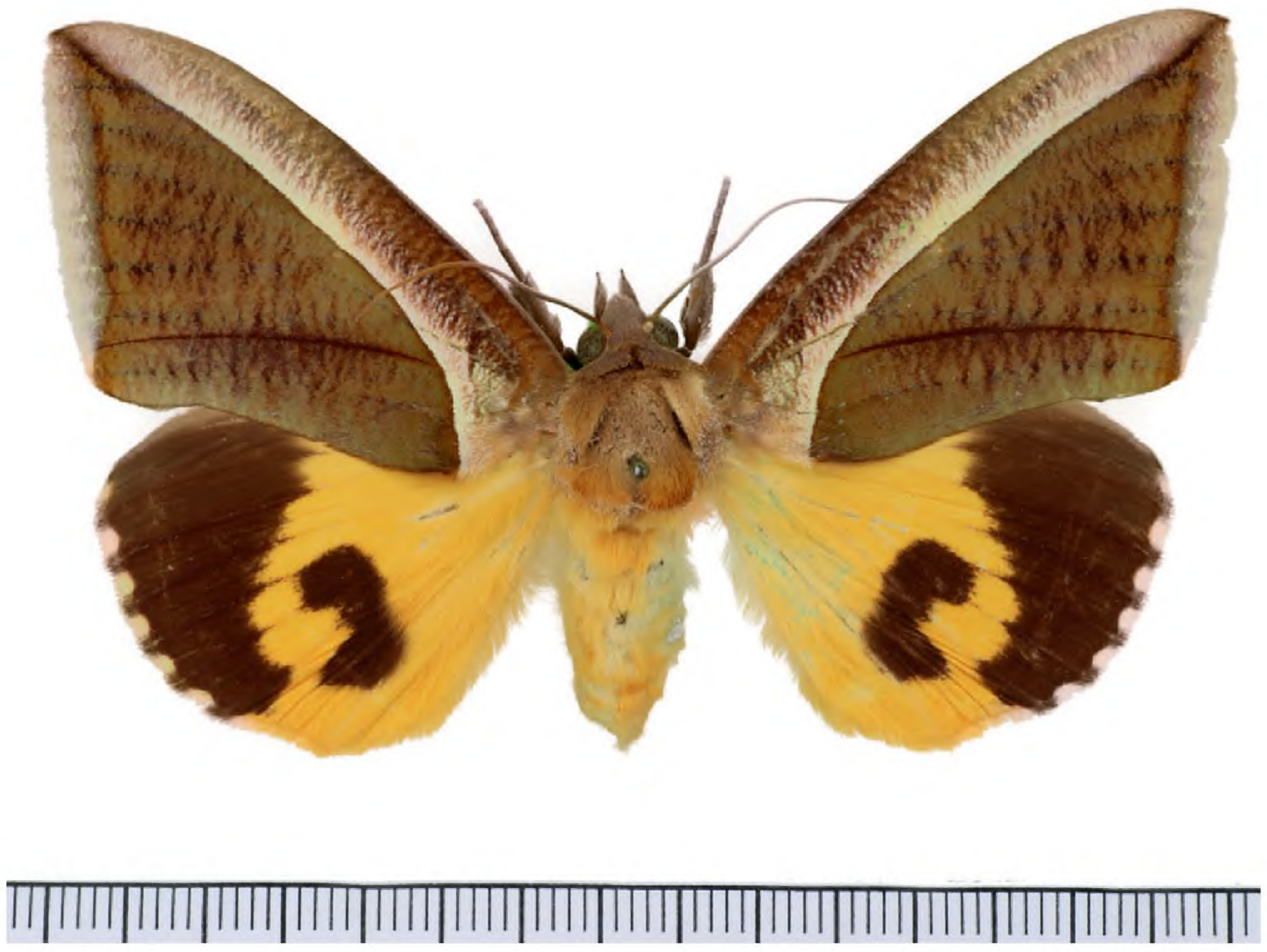

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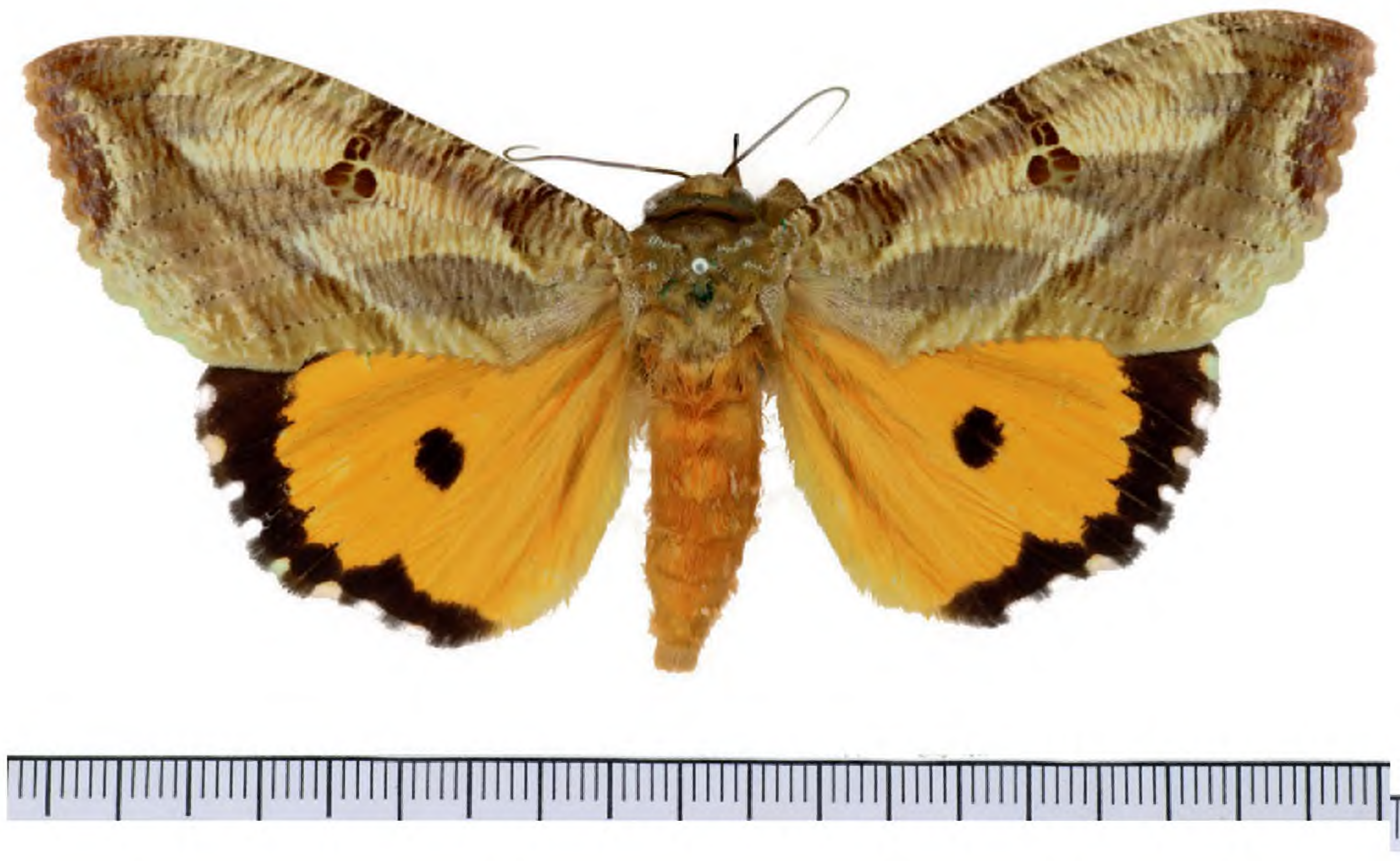
Figures 1-5. Habitus of *Eudocima salaminia* (Cramer, [1777]). 1 – ♂, Vanuatu (Erromango); 2 – ditto, ♀, Vanuatu (Erromango); 3 – ditto, ♀, Vanuatu; 4 – ditto, ♂, Solomon Islands (Guadalcanal); 6 – ditto, ♀, Solomon Islands (Guadalcanal).



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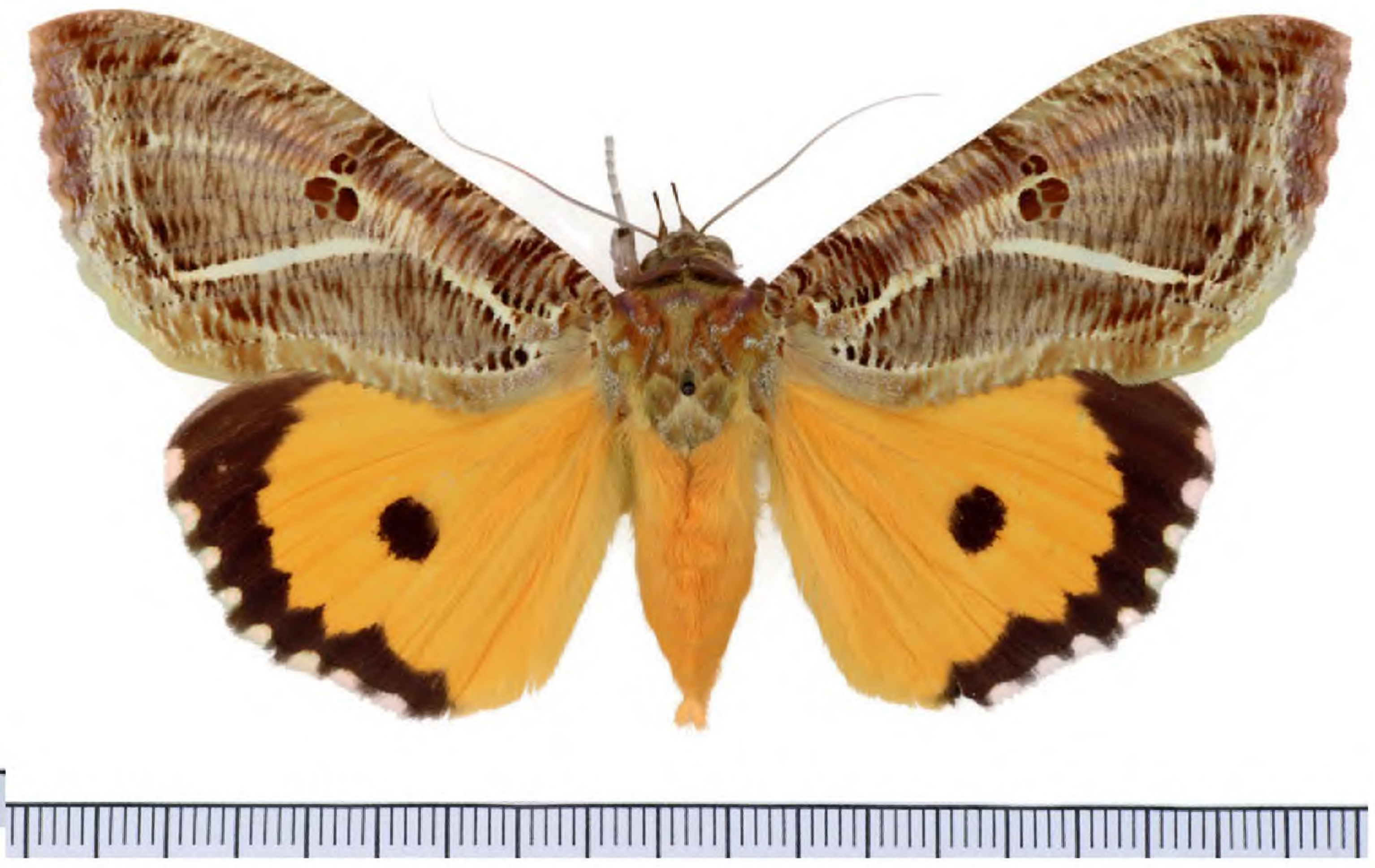

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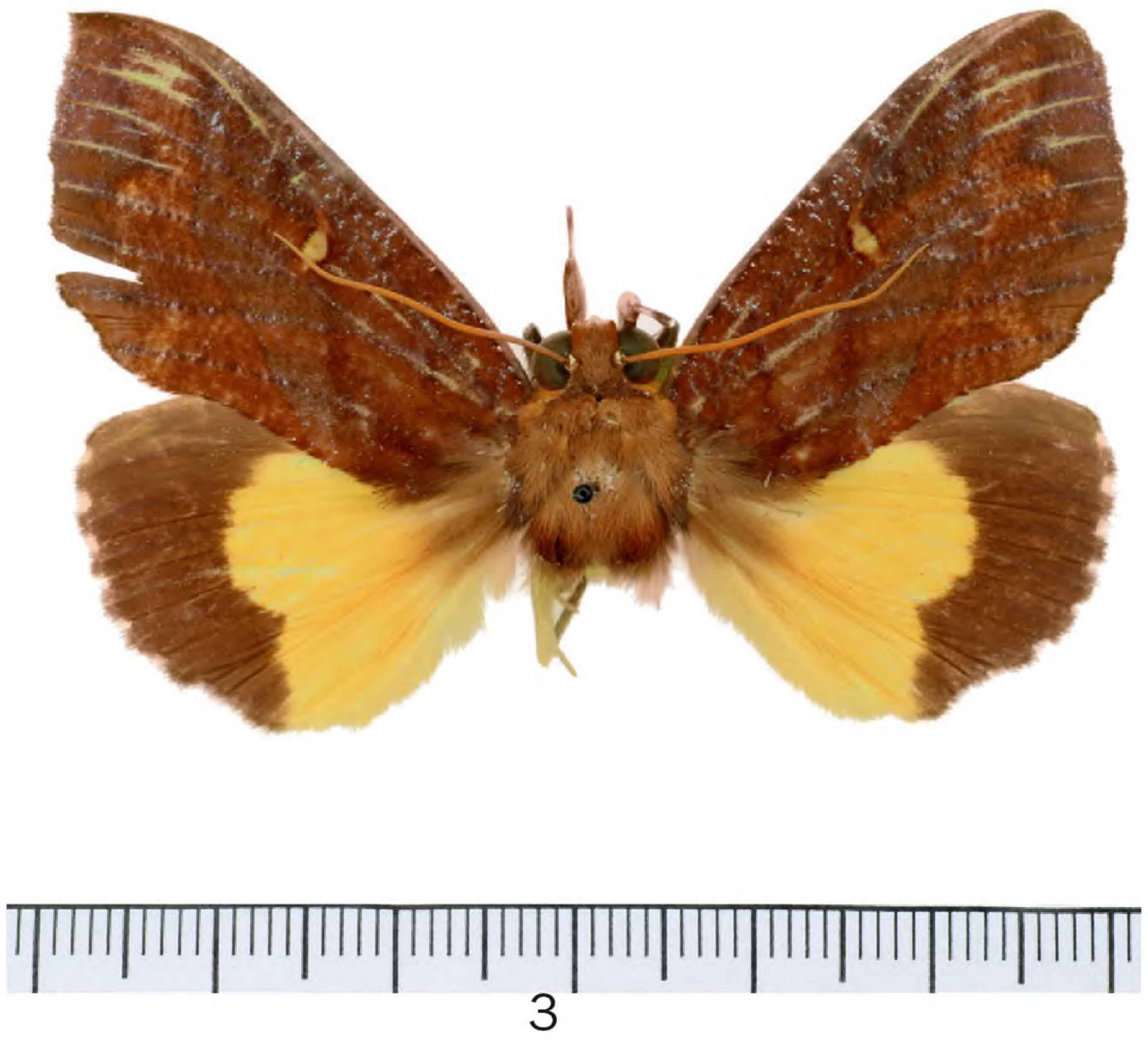

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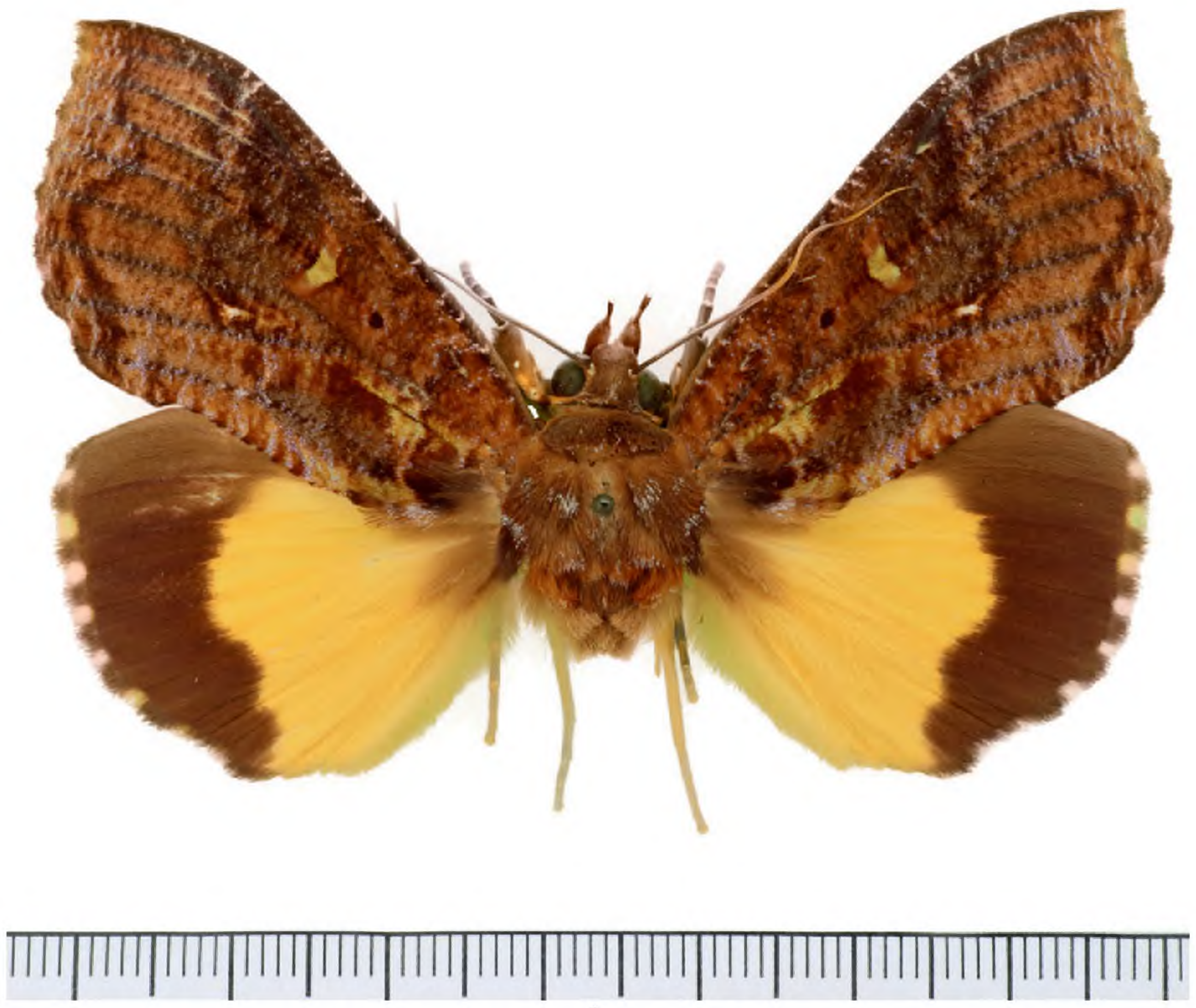

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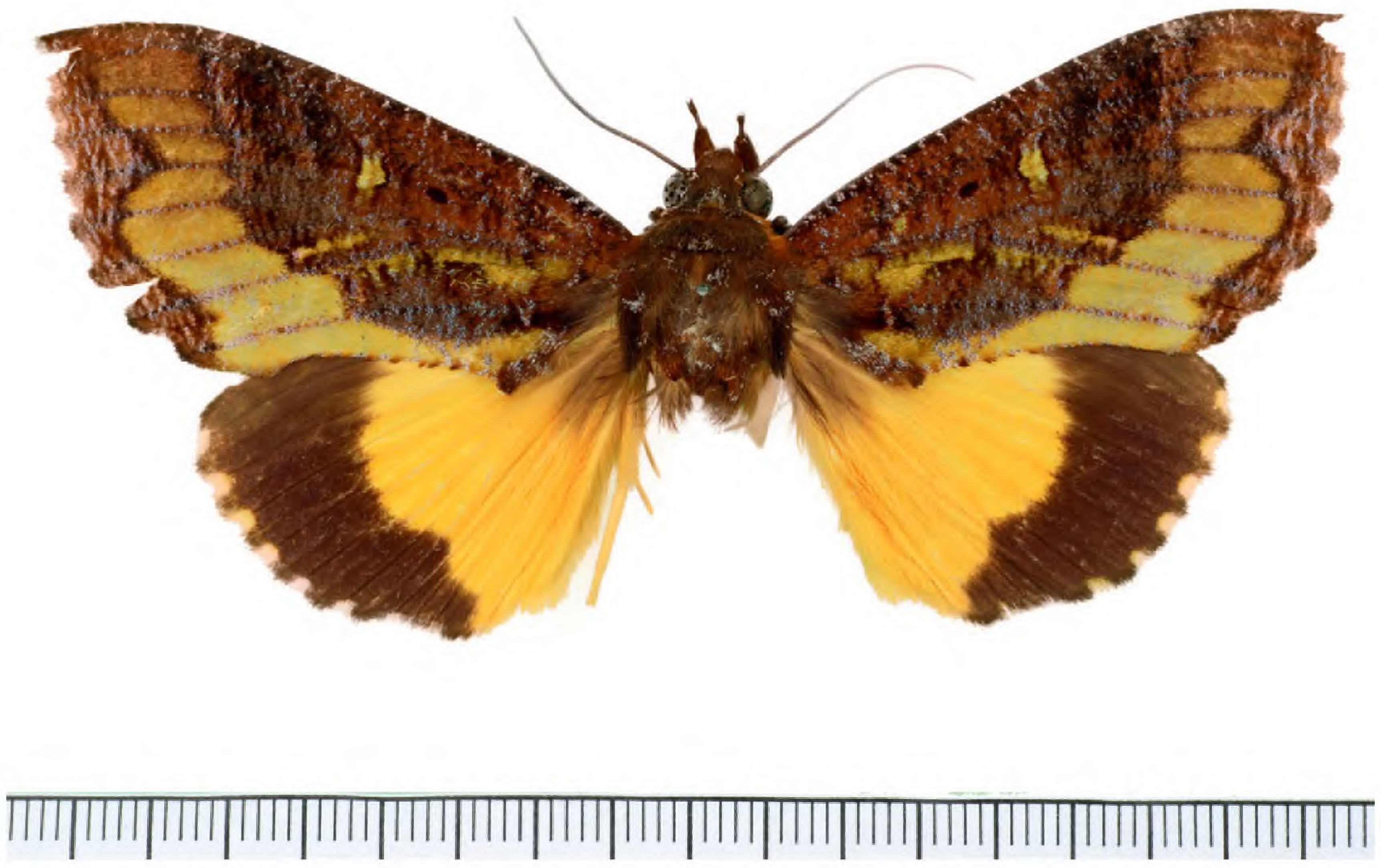

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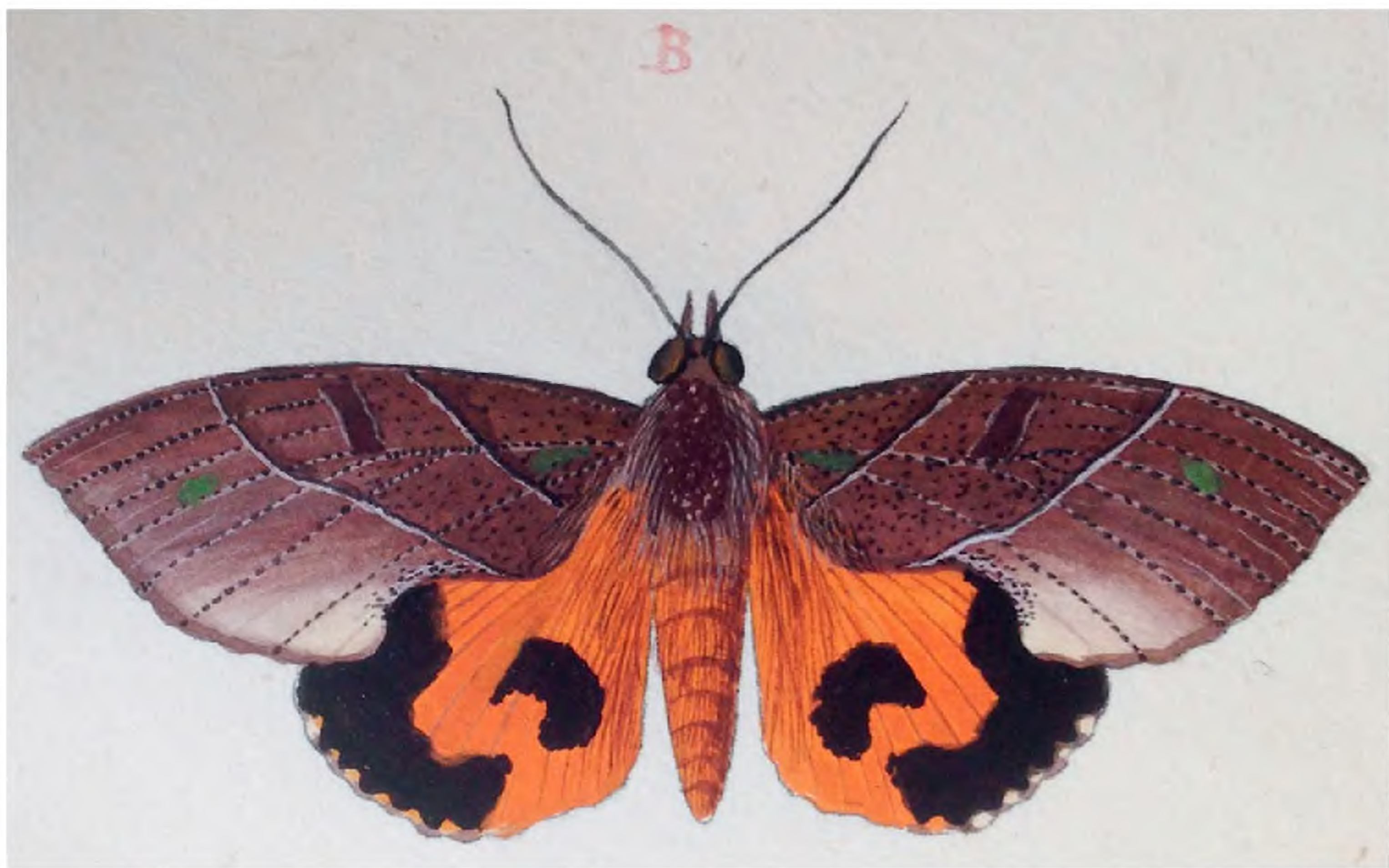
Figures 1-5. Habitus of *Eudocima* species. 1 – *E. materna* (Linnaeus, 1767), ♂, Dawson Strait group; 2 – ditto, ♀, Dawson Strait group; 3 – *E. martini* sp. nov., holotype ♂, Solomon Islands (Rendova); 4 – ditto, paratype ♀, Bougainville; 5 – *E.* cf. *martini* sp. nov., ♀, Solomon Islands (Guadalcanal).

Plate 166

Zilli, A., Brou, V.A., Klem C., Zaspel, J.: The *Eudocima* Billberg, 1820 of the Australian Region (Lepidoptera) ...



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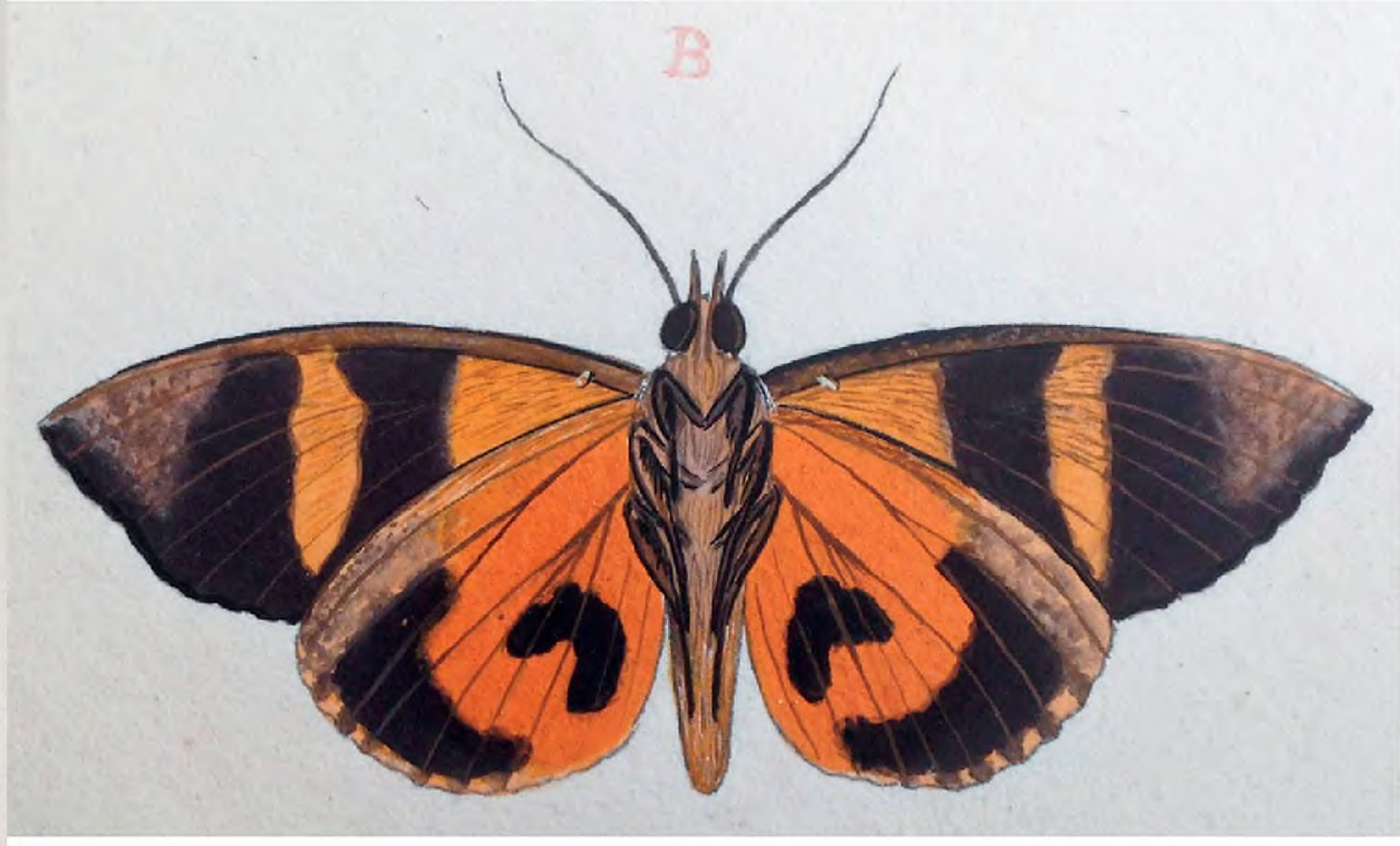

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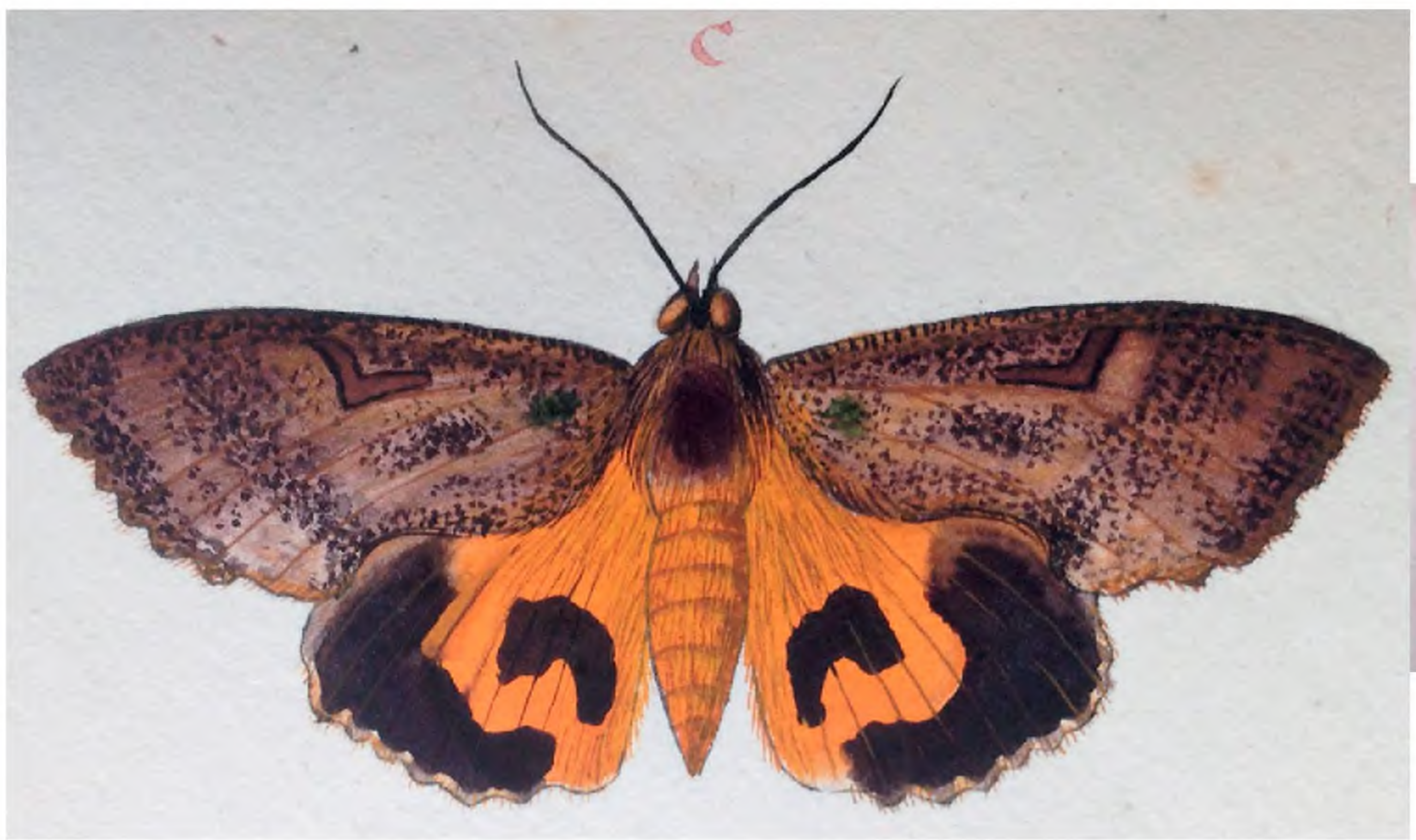

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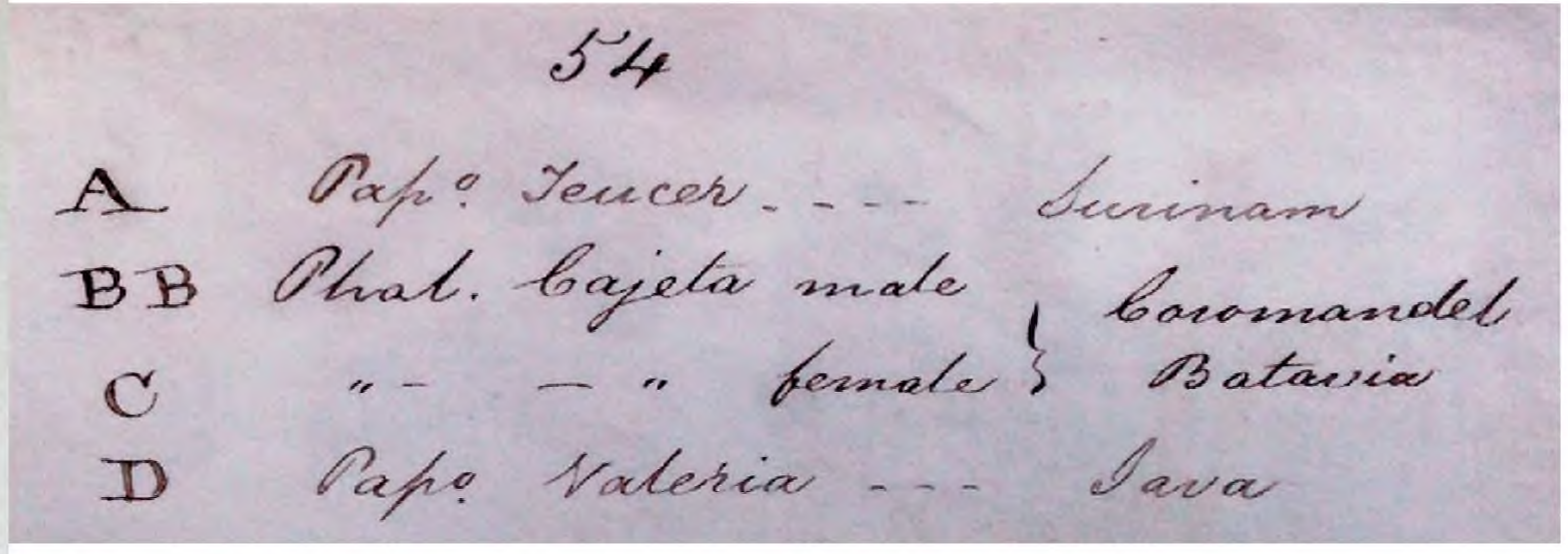


54

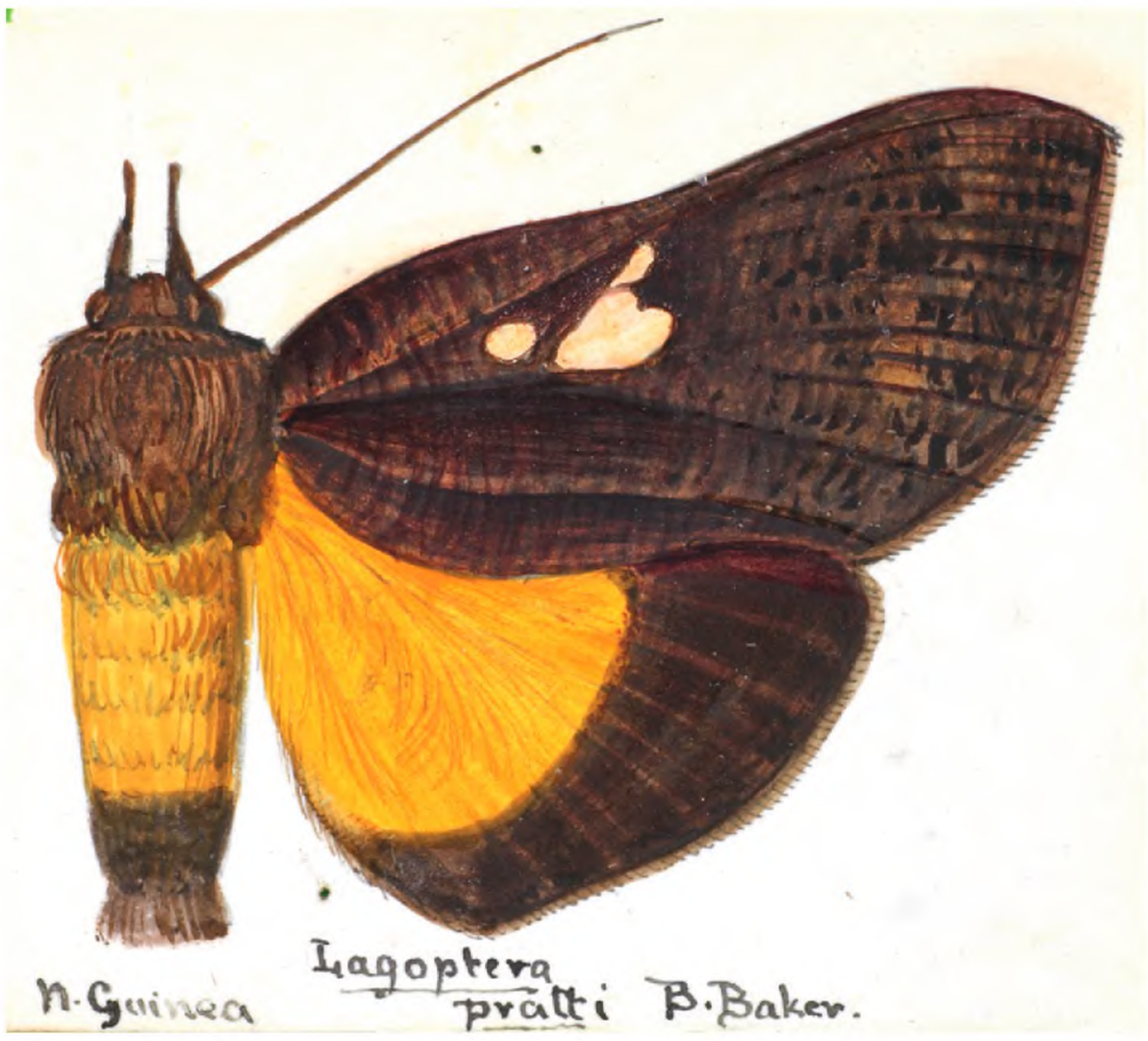
A Papo. Teucer - - - - Surinam

BB Phal. Cajeta male } Coromandel

C " - - " female } Batavia

D Papo. Valeria - - - Java

4



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Figures 1-5. Historical artwork on *Eudocima* species. 1 – Original drawing for Cramer's *Phalaena Noctua cajeta* (male) by Wartenaar Lambertz; 2 – ditto (underside); 3 – ditto (female); 4 – Original legend from plate 54 by Wartenaar Lambertz (undated); 5 – Drawing of holotype of *Lagoptera pratti* commissioned by G.F. Hampson.